American Machinist

December 7, 1932

# Rehabilitation

THREE months ago the gathering of American industrial leaders that met in Washington at the call of the Banking and Industry Committees of the Federal Reserve Banks appointed a National Committee for Industrial Rehabilitation under the chairmanship of Andrew W. Robertson. The purpose of this committee was to bring to the attention of business and industry the necessity of buying equipment that would reduce production costs on operations now being performed, or sure to be started in the immediate future. Also of doing necessary maintenance work in office, store and plant.

● Figures are available to prove how large a contributing factor to unemployment the equipment industries have been. Any effort to revive them, therefore, promised returns far greater than might be expected from a like effort aimed elsewhere. With this opportunity to turn the course of the depression before them, Mr. Robertson's committee were successful in recruiting to their standard some of the outstanding business men of the country. These men were organized by Federal Reserve Districts, by states, and by cities. They are now hard at work and they will continue to function for a long time to come—because the task is so great, and because their organization is non-political and non-partisan, and therefore independent of any change of federal administration.

● Who are these men? How are they organized? What have they accomplished? What is "rehabilitation"? These are some of the questions provoked by the activities of Mr. Robertson and his associates. Because their work means so much to the machinery industry we have devoted this issue to the rehabilitation campaign, in an endeavor to answer the questions, and to show how leading companies of our industry are carrying on rehabilitation of their plant and equipment during these times.

● Mr. Robertson's introductory statement explains clearly and concisely what the rehabilitation movement is, and, quite as important, what it is not. Chairmen of the active Federal Reserve Districts tell how they have organized their districts and what they have accomplished.

● As examples of actual rehabilitation work we have an article detailing the policy of the Chrysler Corporation, one of the most progressive units in the automotive field; another describing the complete rearrangement and re-equipment of a department in the River Works of the General Electric Company, a third telling how the Gleason Works, typical of the most progressive thought in the machine tool industry, has continued its modernization of facilities through the last three years; and a composite story made up of statements from executives of five companies each of whom invested in new equipment for a different reason.

● For any man who thinks he ought to do some rehabilitating of his own plant but who is not sure whether he would be justified in so doing, or how he should reach a decision, we have prepared a simple check sheet on which will be found the commoner machine tools and other units of metal-working equipment, and columns in which to enter the performance figures prerequisite to a decision.

● Every one who is active in this campaign in any way has something to gain from its success. So have you, whether you build printing presses, canning machinery or machine tools. It is to your selfish interest to aid in the revival of industry, because as industry prospers so do you.

● But the by-product of the selfish activity of every man or company engaged in promoting rehabilitation is, like so many other industrial by-products, as valuable to the community as the product. The by-product here is employment, and the resultant of employment is prosperity. We commend to you both the product and the by-product, and we solicit your active support in the effort to secure them.

K. H. Condit

*Editor*

A. W. ROBERTSON

# Organization and Activities of the Rehabilitation—

## What It Is and What It Is Not

A. W. ROBERTSON

*Chairman, National Committee for Industrial Rehabilitation*
*Chairman of the Board, Westinghouse Electric and Manufacturing Co.*

AFTER weeks of preparation and organization activity, of luncheons and dinners and speeches, the preliminary work of the National Committee for Industrial Rehabilitation is generally behind us and tangible results are beginning to appear. The chairmen of the twelve Federal Reserve Districts, with few exceptions, have perfected their own organizations and the committeemen are making valuable contacts with prospective "rehabilitators" in their respective territories.

I shall not try to tell here what is going on in each district nor how much has actually been pledged for rehabilitation work. These facts form the foundation of the regional reports that follow.

During the rather hectic weeks since the Washington meeting of August 28 when the Rehabilitation Committee was appointed we have learned many things. In the first place, if any one of us had the idea that rehabilitation could be put across in a short time he has changed his opinion. The job is entirely too big for any such treatment and we are only now beginning to see how big it is and what tremendous possibilities for industrial revival lie ahead of us.

In the second place, we have learned how hard it is to get the other fellow to comprehend the full meaning of a plan or movement that seems perfectly clear to you after you have been thinking about it and working on it for some time. One of our hardest tasks has been to convince men that the rehabilitation idea is not the emotional appeal to altruism they thought it was.

Since there are probably many men in the metal-working industry who are still hazy about the principle involved and consequently rather skeptical of its value I should like to define it once more so that there shall be no misunderstanding.

The Industrial Rehabilitation Committee is not engaged in a Buy-Now Campaign. It is not urging users of machinery and operators of plants to buy new equipment and look to their deferred maintenance just to make work for the unemployed, although any new employment or re-employment that may result from its effects will be more than welcome. It is not advocating expansion of plant or facilities. It is not suggesting the purchase of equipment that is not needed. It is not recommending unwise depletion of slender cash resources to improve manufacturing facilities. It has been accused of doing all these things.

On the contrary, the Committee is urging the plant owner or manager to do the very things that his own good judgment would direct him to do if conditions were anywhere near normal. It is urging him to do the vitally necessary maintenance jobs that will cost relatively little if done now but will be very expensive if postponed much longer. It is asking him to study his production line to see whether there are operations now being performed that could be done much more cheaply on a new piece of equipment. It is suggesting that he analyze plant transportation, lighting, heating, communication, power production and safety devices from the same point of view.

It is appealing to the industrial executive to act on the results of his investigations, to do those things about the plant that will increase efficiency and lower costs, to buy equipment that can be operated profitably. It is begging him to forget his fears and to use the intelligence that has raised him to his present position of authority. In short, it is insisting that discretion directs the taking of those steps which his most

# National Committee for Industrial Rehabilitation

alert competitors have already taken.

But why is the committee urging action now? For two reasons: Because it is to the self-interest of every industrialist and business man to do the things I have just outlined; and because every dollar spent in maintenance and rehabilitation of plant, of equipment, of distribution facilities multiplies its effectiveness in restoring prosperity as it works back through industry to the basic raw materials. Jobs are created, purchasing power is revived and business is helped along the rocky road to recovery.

Self-interest and the general good seldom coincide so exactly in their aims, but here whatever you do in your own interest helps business recovery, and whatever helps business recovery helps your business.

## A Pyramidal Committee Set-Up

RANDOLPH EIDE
*Chairman, Fourth District*
*President, Ohio Bell Telephone Co.*

• Personal contact is the keynote of the industrial rehabilitation campaign in the Fourth Federal Reserve District. Although the overall picture of the drive is being presented before civic and business groups, the real work of the rehabilitation committee in this territory is being done across desks in private offices.

Each manufacturer has a different problem of modernization and repair. He is interested primarily in the improvement of his particular competitive position by re-equipping or remodeling his plant. He must be approached on the subject of rehabilitation by someone who, himself an executive in industry or business, is not only sure of an entree and a hearing, but capable of convincing management that it should rehabilitate now.

For this reason, the fourth district committee has been organized with an extensive personnel reaching every industrial community in the territory. Men from all industries and businesses comprise the army of workers who are canvassing industrial concerns, both large and small, to stimulate industrial rehabilitation, and these workers are practically all presidents, vice-presidents or general managers of their own businesses.

As an evidence of their sincerity and faith in the soundness of their proposals these workers have first surveyed their own plants and a substantial portion of the early commitments has come from members of the committee themselves.

The organization resembles a huge pyramid with a far-reaching basis covering all of Ohio, western Pennsylvania, eastern Kentucky and a part of West Virginia. The district staff in Cleveland, including the district chairman, two vice chairmen, and a managing director, is at the apex of the pyramid. Between the local committeemen at the base of operations and the apex are nine area committees that coordinate the campaign activities in their territory. The area headquarters are located at Cleveland, Cincinnati, Akron, Youngstown, Columbus, Dayton and Mansfield, in Ohio, and Pittsburgh, Pa. A large number of county organizations operate under the area chairmen, and through their members bring the message of rehabilitation to the doorstep of every industrial concern in their territory.

The fourth district's committee is headed by Randolph Eide, Cleveland, president of The Ohio Bell Telephone Co. Assisting him as vice-chairmen are

Standiford

RANDOLPH EIDE

Earl Martin, Cleveland, former Cleveland Chamber of Commerce industrial commissioner, and George C. Brainard, Youngstown, president of the General Fireproofing Co. D. H. Morris, assistant to the president of The Ohio Bell Telephone Co., works directly under Mr. Eide as managing director of the committee.

The committee's activities in Pennsylvania are supervised by Ernest T. Weir, Pittsburgh, chairman of the board of the National Steel Corporation, who also is a vice-chairman of the National Committee. The Ohio chairmen are: W. C. Connelly, Cleveland, district sales manager of the Foster-Wheeler Corporation; F. A. Geier, Cincinnati, president of the Cincinnati Milling Machine Co.; Fred M. Harpham, Akron, vice-president of the Goodyear Tire and Rubber Co.; Myron I. Arms, Youngstown, president of the Aetna Standard Engineering Co.; Edward Durell, Columbus, treasurer of the Union Fork and Hoe Co.; D. H. Kelly, Toledo, executive vice-president of the Electric Auto-Lite Co.; B. B. Geyer, Dayton, president of the Geyer Co.; and E. M. Olin, Mansfield, plant manager of the Westinghouse Electric and Manufacturing Co.

The first six weeks of the campaign in the fourth district shows favorable results despite incomplete organization of committees. To date, industries in this district have pledged nearly $10,000,000 for improvement and expansion projects. Of this amount, commitments for over $7,300,000 have been pledged by Ohio concerns, the remaining amount having been contributed by industries in the Erie, Wheeling and Pittsburgh areas.

## Cincinnati Makes a Good Start

FREDERICK A. GEIER

*Chairman, Cincinnati District*
*President, Cincinnati Milling Machine Co. and Cincinnati Grinders, Inc.*

FREDERICK A. GEIER

• In organizing the Cincinnati territory for the Industrial Rehabilitation Committee of the Fourth Federal Reserve District the following procedure was adopted:

1. I secured five strong business men to constitute with myself an executive committee.

2. This committee invited the leading business men of the community to a meeting in the Chamber of Commerce Building. About 75 came. We called the meeting for 11 A.M. and promised that it would not last more than one hour. Several speakers put the situation up to the gathering, and I closed the discussion by placing the responsibility for the success of the movement on every man present. Entirely unexpectedly, one of the men present got up and offered a resolution that every man in the room pledge himself to cooperate with the committee, and accept any work that the committee asked him to do. The motion carried unanimously.

3. A letter fully covering the appeal was sent to 500 business firms. The response was very generous. Those replying endorsed the movement, expressed a willingness to cooperate, and some even specified what they proposed to do.

4. Further meetings with small groups were held, among them the representatives of the steel corporations, and the Allied Construction group.

5. Small committees went out through the city, making personal calls to follow up such leads as we had.

6. We tried to get the neighboring counties in Kentucky to organize themselves on a similar basis, but without very satisfactory results, probably because the region is predominantly engaged in coal mining.

7. We were successful, however, in getting a strong committee started in Covington and Newport.

On November 21 I made a radio address from a Cincinnati station, reporting pledges for improvements totaling $3,800,000 in the Cincinnati area proper, and $1,500,000 in the Covington-Newport district. We are confident that we shall have more results to report as our committees complete their first assignments and can put more time on following-up.

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# Broad Program Employs Radio

R. F. PACK

*Chairman, Ninth District*
*President, Northern States Power Co.*

*Blank-Stoller, Inc.*

R. F. PACK

• The Ninth Federal Reserve District includes northern Wisconsin, northern Michigan, and all of Minnesota, North Dakota, South Dakota and Montana. Quick organization of rehabilitation work was made possible by the cooperative spirit of outstanding business men who readily undertook responsibility to do their part. This spirit was inspired by a general feeling that an upturn in business was becoming evident and a conviction that the Committee's program was sound and prudent.

First of all, forty-seven outstanding business men located at strategic points in the six states were appointed as regional chairman. I retained the chairmanship for the city of Minneapolis with a view of gaining practical experience which might help other regional chairman. Frederic Crosby, vice-president of the American Hoist and Derrick Company of St. Paul, was appointed vice-chairman for the entire district and local chairman of the St. Paul territory.

As a first move toward organizing

Minneapolis, I called a meeting of officials of the following associations:

Minneapolis Retailers' Association.
Manufacturers' Association of Minneapolis.
Minneapolis Civic and Commerce Association (Wholesalers' Section).
Minneapolis Association of Building Owners and Managers.
Apartment Owners' Association.
Minneapolis Hotel and Restaurant Association.
Northwest Lumbermen's Association.
Minneapolis Builders' Exchange.

They pledged cooperation and undertook not only to reach their own members, but non-member firms in similar lines.

The Minneapolis Civic and Commerce Association sponsored a noon-day mass meeting attended by about 600 business men on September 12. This meeting was addressed by George D. Dayton, Ninth District Chairman of the Banking and Industrial Committee, and myself, and the proceedings were broadcast through the courtesy of KSTP Radio Station.

On the night of September 16, WCCO Radio Station gave me opportunity to address the radio public. Again on September 27 this station was made available to me in a unique and practical way. Many of the regional chairman had asked me to address meetings in their various communities, and as this was obviously difficult, I wired all chairman to hold meetings on the night of September 27 in meeting places where radio receiving sets and loud speakers were available. In this way I was able to address nearly 50 meetings in as many cities in six different states at one time. At the conclusion of my radio talk that night, regional chairmen and other speakers continued these meetings.

The newspapers from the very start gave freely of their space to acquaint the general public with the Committee's program. This newspaper publicity and these radio talks have been supplemented by bulletins addressed to the regional chairmen. The bulletins, made up largely of presentation of definite results accomplished throughout the territory, served to acquaint all the chairmen with what was being accomplished elsewhere. They also contained suggestions as to practical methods of organization.

We have consistently refrained from anything in the nature of ballyhoo, flag waving, or even appeal to local or national patriotism, but have advanced the program of the Rehabilitation Committee as a sane, sound and prudent business policy, emphasizing that merchandise can be bought and materials and labor obtained at a lower cost now than later on, and that business judgment most urgently suggests that this is the time for merchants to replenish their stocks, the time for factories to modernize their machinery and to make other improvements, and the time for home owners to improve, repair, repaint and modernize their homes.

This Ninth District is largely agricultural in character and is not noted as a center for great industrial plants as in the East. However, we have some large industries and many small one. We have not overlooked the necessity for carrying to all these industries the emphatic suggestion of the wisdom of installing modern machinery, but we have not limited our program to this work. It has been broadened so as to emphasize to store owners and the general public the wisdom of purchasing on the apparent eve of higher prices, and also the wisdom of modernizing and repairing homes.

Following are some of the gratifying reports which have been received:

The Homestake Mining Company at Lead, South Dakota, has started construction of a new cyanide metallurgical plant at an estimated cost of .....$250,000

The Montana Power Company, Great Falls, Montana, announced its plans to construct an absorption plant and refinery near Cut Bank at an estimated cost of ...$100,000

During the last seven months in the Eau Claire district the Gillette Rubber Company has spent $107,000; the National Pressure Cooker Company, $100,000; the Northwest Motor Company, $10,000; the Dells Paper and Pulp Company, $50,000, on modernization, new machinery, building improvements, etc., with a total of..$267,000

# Engineers Help on Coast

WILLIAM A. ROSS
*Chairman, Twelfth District*
*Vice-President, Columbia Steel Co.*

• The Twelfth Federal Reserve District includes the seven western states of California, Oregon, Washington, Nevada, Idaho, Utah, and Arizona. The Committee for the Stimulation of Industrial Rehabilitation in the Twelfth District was organized under the chairmanship of William A. Ross, vice-president and general manager of sales of the Columbia Steel Company, with district headquarters in San Francisco. The district was subdivided into seven major industrial areas each having a chairman and assistants in the principal cities as follows:

San Francisco (City and County):
J. A. Cranston, vice-president, General Electric Co.
Raymond M. Alvord, manager, General Electric Co.
San Francisco Eastbay Region:
A. J. Mount, executive vice-president, Central National Bank, Oakland.
E. H. Geary, vice-president, Central National Bank, Oakland.
Los Angeles, California:
J. A. H. Kerr, vice-president, Security First National Bank, L. A.
Portland, Oregon:
O. B. Caldwell, vice-president, Portland General Electric Co.
Seattle, Washington:
O. D. Fisher, president, Fisher Flouring Mills, Seattle, Wash.
Spokane, Washington:
J. E. E. Royer, general manager, The Washington Water Power Co.
Salt Lake City, Utah:
W. J. O'Connor, manager, American Smelting & Refining Co.

The committees in the several areas are composed of individuals whose definite knowledge of industrial conditions and requirements qualifies them for the undertaking of selling business executives and plant owners on the subject of factory modernization and improvement of production facilities. In some of the larger cities the local engineering council endorsed the national movement, and

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WILLIAM A. ROSS

the local chapters of national engineering societies instructed their members to assist the local Industrial Rehabilitation Committee by offering the services

of the mechanical and industrial engineer members without compensation to the plant owners. In some of the larger industrial centers the soliciting team of the Industrial Rehabilitation Committee consisted of a consulting mechanical engineer, and a general manager of a machinery supply firm, who interviewed the executives of factory or industry.

As in all growing centers of activity, the major industrial problems in the Twelfth District have been closely related to the fields of transportation and agriculture; distribution of water, gas, and electricity; and the supplying of raw materials of manufacture. It is only natural that under present-day conditions conspicuous response to the missionaries of industrial modernization should be found in the attitude of the gas, electricity, and telephone companies, and in the operation of basic industries, such as lumber, petroleum, cement, metals, food products, and various other lines of a diversified character.

Among important appropriations by such firms may be noted the following:

| | |
|---|---|
| Associated Oil Co. | $6,000,000 |
| Pacific Gas & Electric Co. | 5,000,000 |
| Standard Oil Company of California | 3,000,000 |
| General Petroleum Refinery, Torrance, Calif. | 1,500,000 |
| Southern California Edison Co. | 1,300,000 |
| Southern California Telephone Co. | 1,000,000 |
| Standard Brands of California. | 750,000 |
| Columbia Steel Co. (a subsidiary of the U. S. Steel Corp.) Pittsburg & Torrance California Plants | 700,000 |
| Gladding, McBean & Co. (California Plants) | 400,000 |
| El Dorado Oil Co., Oakland, Calif. | 400,000 |
| Albers Bros. Milling Co., Oakland, Calif. | 300,000 |
| Utah Oil Refining Co. | 250,000 |
| Fisher Flouring Mills Co., Seattle, Wash. | 100,000 |
| Poole & McGonigle, Portland, Ore. | 50,000 |

From a geographical point of view, the location of this district at the extreme western frontier of our country, with its outlook toward the Orient, has been recognized as an important factor in the argument toward an appreciable expansion of plant facilities of all kinds. Whatever the business lag may be at this time, the very situation of the district must necessarily result in increased requirements, and executives alive to the situation are making preparations for the coming demands upon industry in these western states. Quite in line with this, the public service corporations, steel mills, cement plants, and other branches of activity are placing themselves in a strategic situation for the future expansion of customer demands and at the same time are exerting a very important influence upon the solution of the unemployment problem.

It is a fortunate circumstance at this moment when concerted effort is being made to re-establish normal business conditions that the two great bridge projects in this district which have long been under development should reach a point where beginning of construction operations may soon be expected. Construction of the Golden Gate Bridge and the San Francisco-Oakland Bay Bridge will mean the expenditure of over one hundred million dollars.

# Organizing a Complex Region

JAMES G. HARBORD
*Chairman, Second District*
*Chairman of the Board, Radio Corporation of America*

• The second Federal Reserve District Committee is responsible for New York State and Northern New Jersey. It has a two part job to organize the numerous industrial communities throughout this territory for the coverage of local industries and also to develop the possibilities for national influence through the front offices of American business located here in New York City. Work in the upstate cities is proceeding with strong men heading the committees. The program for New York City is progressing more slowly, as is always so in the metropolis. A committee has been formed of the heads of the leading companies manufacturing machinery, equipment and supplies used by industry, which is undertaking leadership in focusing the national sales policies of the equipment industry, in harmony with the rehabilitation movement, to assist in carrying the message of modernization throughout the country where their salesmen are calling on factories or other buildings where production and operating costs can be reduced by re-equipment. This committee will also assist in canvassing selected manufacturing companies in New York City, to urge them to modernize their own properties now.

It will work through a group of subchairmen drawn from different industries who will organize groups to canvass each field. The intensive job of canvassing the factories, warehouses and other large buildings in New York, Brooklyn and Long Island City will therefore be broken down under men with special knowledge of each field who will cover the area of the greater city by making contact with that minority of larger companies which provides the source of the greater part of the production in each line and therefore offers the best prospect for rehabilitation.

Another important committee is working with the national engineering societies to develop the cooperation of

JAMES G. HARBORD

the mechanical, electrical, civil, mining and chemical engineers throughout the country, the men who in so large measure guide the progress of all our manufacturing industries. The statement of William L. Batt, vice chairman for the Second District, gives details.

## Engineering Societies Cooperating Effectively

WILLIAM L. BATT
*Vice Chairman, Second District*
*President, SKF Industries, Inc.*

• Because the national engineering societies have their headquarters in New York City the Rehabilitation Committee of the Second Federal Reserve District assumed as one of its responsibilities the task of organizing cooperation of these groups. The members of the American Society of Mechanical Engineers are very directly concerned with any program of industrial rehabilitation and their society offices were therefore the first to be approached.

Acceptance of the rehabilitation idea was immediate and cordial. The Management Division of the society accepted

sponsorship for society cooperation and staged a meeting on November 16 at which Malcolm Muir, president of the McGraw-Hill Publishing Co., and vice-chairman of the New York District as well as member of the central committee, presented the case for rehabilitation. Similar meetings of mechanical engineers in other cities will be promoted by the Management Division.

To place the rehabilitation plan before the whole society as promptly and as forcefully as possible, the council of the society invited Andrew W. Robertson, chairman of the board, Westinghouse Electric & Manufacturing Co., and chairman of the central committee, to deliver the Henry Robinson Towne lecture on December 6. By the terms of the lectureship foundation, the lecturer is expected to concern himself with some phase of the relationship between engineering and economics. Since the solution of many of the problems of the depression must be found by management and the engineer it was considered appropriate to ask Mr. Robertson to present the rehabilitation plan as one method of seeking for a satisfactory solution.

For good measure, General Harbord, chairman of the board, Radio Corporation of America and chairman of the Second District committee, was invited

WILLIAM L. BATT

to be the speaker at the annual dinner on the following evening. As this is written, his subject has not been definitely determined, but it will tie in with rehabilitation work.

The Management Division then decided to omit the usual short talks on safety which have been part of the program of most of the technical sessions at the annual meeting, and to substitute for them addresses of corresponding brevity giving the basic principle of the campaign. Selected speakers will address fifteen of the sessions.

A somewhat similar, though less elaborate, presentation will feature the annual meeting of the Society of Automotive Engineers in Detroit late in January. Col. James L. Walsh, vice-president of the Guardian Detroit Union Banking Group and chairman for Michigan of the Industrial Rehabilitation Committee, will address a luncheon meeting on January 26. Other speakers will make brief presentations at eight of the technical sessions.

These are the tangible accomplishments. The American Institute of Electrical Engineers will be approached shortly, and there is every reason to believe that they will cooperate heartily. Other groups will be tied in as rapidly as we can get in touch with their executive bodies.

This whole rehabilitation program demands careful organization and thoughtful planning. Success must not be expected over night. The cooperation of the engineering profession has been sought on this basis because engineers are in a particularly favorable position to support the drive to improve management methods which is really a major objective of the Robertson committees. They can proceed with the long-range effort long after the enthusiasm of the industrial leaders who make up the committee personnel may have spent itself, or been diverted to other worthy causes.

# All Existing Agencies United

HARRY C. KNIGHT
*Chairman, First District*
*President, Southern New England Telephone Co.*

• The New England Committee on Industrial Rehabilitation was organized at the meeting held under the auspices of the New England Council on October 12 at the Hotel Statler, Boston.

The committee consists of Harry C. Knight, president, Southern New England Telephone Co. and president of the New England Council, chairman; Ralph E. Flanders, vice-president, Jones & Lamson Machine Co., Springfield, Vermont, vice chairman; W. Gerald Holmes, Central Maine Power Co., Augusta, Maine, Maine chairman; and F. E. Banfield, Saco-Lowell Shops, Biddeford, Maine, vice chairman; Major A. Erland Goyette, The Joseph Noone's Sons Co., Peterboro, N. H., New Hampshire chairman, and Laurence B. Holt, Scott & Williams, Laconia, N. H., vice chairman; E. C. Mayo, president, Gorham Co., Providence, Rhode Island chairman, and Henry D. Sharpe, president, Brown & Sharpe Manufacturing Co., Providence, vice chairman; John H. Goss, vice president, Scovill Manufacturing Co., Waterbury, Connecticut chairman, and Col. L. S. Horner, vice president, The Bullard Co., Bridgeport, vice chairman. Members-at-large are James W. Hook, president, Geometric Tool Co., New Haven, Conn.; Louis J. Hunter, vice president, National Shawmut Bank, of Boston; and Morton C. Tuttle, president, Morton C. Tuttle Co., Boston. Ray M. Hudson, industrial executive of the New England Council, is secretary of the New England Committee on Industrial Rehabilitation.

The plan of operation of the New England Committee is:

1. Through its state and community committees to seek the cooperation of all existing agencies in position to promote and expedite the rehabilitation movement in their respective geographical areas and fields of industrial activity.

2. To approach, first, those firms hav-

HARRY C. KNIGHT

ing cash or credit and, therefore, in position to undertake modernization programs immediately; and, second, firms whose current business and prospects

warrant plant rehabilitation but which are not in as good position to start now as is the first group.

In Massachusetts, the Associated Industries has undertaken to secure a state chairman, who in turn will appoint his vice chairman, and together they will organize their state committee.

In Rhode Island, Chairman Mayo and Vice Chairman Sharpe convened a meeting November 22 to organize their state committee.

In Connecticut, through the activities of Chairman Goss and Vice Chairman Horner, community committees have been organized in Bridgeport and Hartford, and are being organized in New Haven, Stamford and Waterbury.

It must be recognized that there are two factors to be considered in connection with the modernization movement in New England:

1. The work of the New England Council which, since the Council was organized in November, 1925, has steadily promoted modernization of New England plants, etc., as a means of enabling New England industry to hold its competitive position.

2. New England has come through the depression in relatively better condition than any other industrial area, due to the diversity of its industries, the soundness of its financial institutions, and, again, the stabilizing influence of the New England Council's work.

On the other hand, the *American Machinist's* survey of a representative number of New England metal-working plants showed that 63 per cent of their equipment was ten years old or more. Considering the advancement made in recent years in machine development and in the art of cutting metals, it is obvious that there is still much modernizing that is economically sound and justifiable to be undertaken in and by New England industry.

It is to the New England firms who should and who are in position to modernize that the New England Committee on Industrial Rehabilitation is directing its attention.

3. The committee will approach the prospect manufacturer on the better profits he can make through modernizing—it being recognized that the need for better profits is the basic reason for modernization. There will be no attempt to work up an emotional campaign.

The Rehabilitation Committee for the State of Maine, under Mr. Holmes' leadership, reports "numerous projects under way. Much still remains to be done, and the State of Maine committee is following up on all the possibilities offered by the industries of the State."

In New Hampshire chairman Goyette and vice chairman Holt are being aided by a committee appointed by the New Hampshire Manufacturers' Association. Major Goyette reports that the state has been divided into eight industrial districts, with the following cities as district centers: Littleton, Dover, Keene, Claremont, Nashua, Manchester, Concord, and Laconia.

Chairmen have been appointed for three of these districts as follows: Concord—W. T. Bell, Page Belting Co., Laconia—William Veazey, Boulia-Gorrell, Laconia, Keene—Claude A. Putnam, Putnam Machine Shop, Keene. Chairmen for the other districts will soon be announced. Theodore W. Gunn of the New Hampshire Board of Underwriters has been appointed a member-at-large.

In Vermont, the organization of a state-wide committee was undertaken on November 22 in conjunction with the annual meeting of the Associated Industries of Vermont. It is planned that the personnel chosen for the Rehabilitation Committee will also canvass the firms on whom they call with regard to cooperating in the Share-the-Work Movement. Similarly, the Vermont Share-the-Work personnel will canvass firms regarding cooperation in the rehabilitation program. Much is expected from this cooperative effort.

# Trade and Regional Groups

JAMES D. CUNNINGHAM
*Chairman, Seventh District*
*President, Republic Flow Meters Co.*

• The Committee on Industrial Rehabilitation of the Seventh Federal Reserve District has its headquarters in Suite 1148, 120 South La Salle Street, Chicago; and is divided into an executive committee composed of: James D. Cunningham, chairman; Robert M. Gaylord, vice-chairman; John M. Rodger, vice-chairman; and individual state committees, of which Floyd O. Hale is chairman of Illinois; Whitney Eastman, chairman of Wisconsin; Col. James Walsh, chairman of Michigan. The chairmen for Indiana and Iowa have not as yet been appointed.

The state of Illinois will be handled somewhat differently than the other states, due to the large population of the Chicago District. The state has been divided into two parts:

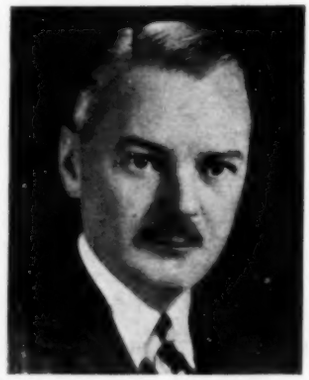
(1) The Chicago District, with W. O. Kurtz, chairman.

(2) Outside Chicago, with E. C. Heidrich, of Peoria, chairman.

The Chicago District is broken down into trade groups, such as food products, iron and steel, electrical products, machinery products, building materials, etc., with a chairman for each individual group. These chairmen organize their individual committees within their group for the actual contact work.

In addition to these trade groups there are suburban groups, including Aurora, Elgin, Geneva, Joliet, Harvey, Chicago Heights, and Waukegan. A chairman has been appointed in each of these suburban districts, who in turn organizes his own committee for contact work in his district.

Outside the Chicago District, Mr. Heidrich has appointed chairmen for the various industrial districts, such as Danville, Decatur, Bloomington, Rockford, etc. These industrial district chairmen organize a group of men in their district for contact work; all of these district men clearing through Mr. Heidrich, in Peoria, who in turn reports to the executive committee in Chicago.



JAMES D. CUNNINGHAM

At the outset, it was very apparent

that the work of industrial rehabilitation could not be successfully done without a complete understanding of the basic ideas behind this movement. In order to carry out the work effectually all of the various chairmen, as soon as they were appointed, were brought into headquarters, sometimes in groups and some times individually, and thoroughly oriented with the plan. They were advised to organize their committees and then to bring in their committees for a group discussion on the subject.

This has been a long and arduous task, but we felt that industrial rehabilitation was one of the most important movements in bringing industry back. We proceeded on the assumption that asking industrialists to spend money at this particular time was a most delicate question, and that unless the proposition was presented correctly more harm than good could be done. We are now assured that all of our contact men are in the position of propounding industrial rehabilitation in a sound, justifiable manner.

We are proceeding with this basic idea in all of the other states in the Seventh Federal Reserve District, and while the results must necessarily be slow in starting, we feel that we will make an appreciable showing.

We have arranged that all commitments for expenditures will clear through the Chicago headquarters, and will be reported to the national headquarters in Pittsburgh, weekly.

Although many of our subcommittees are just beginning to get under way we can report some commitments that are typical of what we expect from the Seventh District. Among them are some from the Southern Wisconsin territory. A statement by Mr. Eastman, chairman for that section, follows.

U. S. Gypsum Co.—$400,000 for plant extension

International Harvester Co.—$1,100,000 for new equipment in several plants, some of it now being installed

Link Belt Co.—$20,000 for modernization of equipment

National Manufacturing Co.—$20,000 for improvements to plant and equipment

Northwestern Barb Wire Co.—$36,000 for improvements to plant and equipment

Allis-Chalmers Manufacturing Co.—$203,000 for new equipment and modernization of existing equipment

National Enameling and Stamping Co.—$10,000 for new equipment and modernization

In Rock County, various companies in Beloit will spend a total of $142,500, and several in Janesville will spend a total of $20,716. In Shawano County, Clintonville companies have announced commitments of $77,297.

## Southern Wisconsin Shows Active Interest

WHITNEY H. EASTMAN

*Chairman, Southern Wisconsin District*
*President, The William O. Goodrich Co.*

WHITNEY H. EASTMAN

• The Wisconsin Division of the Seventh District is very much gratified with the general interest which is being shown in the Industrial Rehabilitation Program in this district. This program was launched at a time when industry in the state was seriously hampered by heavy taxation and political uncertainty and those enlisted in the work here hope to stem the tide of industrial dehabilitation, which during the past few years has threatened the social and economic welfare of every resident of the state. Since the program was launched a new political party has come into power in the state and this has helped the movement very materially. It is felt that the fast growing tax burden will not be further increased and will probably be reduced.

Without enumerating the specific results thus far achieved, the success is far greater than had been anticipated. All types of industry, commerce and business are making substantial appropriations in this war on obsolescence. Our program here encompasses the agricultural areas where much work is being undertaken in home modernization, which idea found birth in this state. This field in itself provides a tremendous potential market for labor and materials.

It is rather surprising to note how many factories have made surveys of their production costs and are fast realizing that they must scrap much obsolete mechanical equipment and replace it with more modern machinery in order to compete with their competitors who have already done so. It is felt here that the momentum will increase as the program is carried on. Manufacturers will be forced to modernize both buildings and machinery in order to compete or go out of business.

In Wisconsin we have a chairman for each county and the county chairmen in turn have reassigned certain areas of the county to sub-chairmen, taking advantage insofar as is possible of the division between the industrial and agricultural areas. Every portion of the state coming within the Seventh District is being actively covered and each day the army of public-spirited men engaged enthusiastically in this work are reporting the growing results of their efforts.

# Some Sound Policy Statements

ALBERT B. ELIAS

*Chairman, Eighth District*
*President, Southwestern Bell Telephone Co.*

• The organization of the Eighth Federal Reserve District is complete except at Memphis and Louisville. Committees of executives have been formed and are at work in the following cities:

| | |
|---|---|
| St. Louis, Mo. | Mt. Vernon, Ill. |
| East St. Louis, Ill. | Quincy, Ill. |
| Belleville, Ill. | Hannibal, Mo. |
| Granite City, Ill. | Springfield, Mo. |
| Alton, Ill. | Little Rock, Ark. |

Briefly, the plans and objective of the Committee are as follows:

1. To promote as widely as possible the idea of industrial rehabilitation and modernization, to encourage executives to consider this subject, making surveys of conditions in their own plants, and to undertake sound and necessary projects needed under present production conditions.

Straus Studio

ALBERT B. ELIAS

Personal contacts are being made on the executives of the larger firms by members of the committee.

Medium and smaller industries are being covered by letters, enclosing a folder containing a concise statement of the plan. These are supplemented by personal contacts in those cases where the executives are known to committee members.

The idea is being further promoted by furnishing speakers and publicity to such as the Engineers' Club, Purchasing Agents Association, Electrical Board of Trade, etc.

Effective general publicity is being secured through a firm of publicists who are donating their services.

2. To gather information on rehabilitation and modernization projects under way or contemplated. This information is for the purpose of influencing other executives to consider this subject and to take action *now* on projects which would otherwise be deferred.

There is ample evidence that satisfactory coverage is being obtained in the promotion of this idea. Within the past three weeks, from the St. Louis and East St. Louis Area, with only 20 per cent of the committee reporting (including the results from the first two of the series of three letters to the smaller concerns), information has been collected of total expenditures for rehabilitation or modernization projects now under way or contemplated of $4,792,500. This information is furnished weekly to committee members and to the newspapers.

Here are some statements of policy by leading industrialists of this district:

> We have pursued the policy during the past 2 years of thoroughly rehabilitating our plants, throwing out old and inefficient equipment and replacing it with new . . . we have done this because we believed that the present conditions would not remain with us always, and in the doing of it we could purchase equipment at a lower cost.
>
> *National Candy Co., Inc.*

> We have continued to make improvements to both our buildings and machinery, feeling that now is the best time to do this work and prepare for the rush which must necessarily come later.
>
> *A. Leschen & Sons Rope Co.*

> At East St. Louis we have modernized our whole operation so that we are able to produce our product with double the efficiency of three years ago.
>
> *The Sandusky Cooperage and Lumber Co.*

> The amount our company has expended since the first of 1932 for plant improvement and increased machine efficiency in our Operating Department amounts to approximately $30,000 . . . we are distinctly more efficient today than in 1929.
>
> *Sefton National Fibre Can Co.*

> Our company has moved to a building that has been modernized by the owners with the help of ourselves for portion of same occupied by us. In making the change, we have not sold, but have scrapped machinery that we felt had better been so disposed of than to sell it to other parties for further use. We are ready to replace this and make other additions as business justifies, with more modern machinery.
>
> *Robertson Envelope & Printing Co.*

> A few years ago we built a strictly modern foundry and equipped all departments except our cleaning department with the last word in foundry equipment. We thought we were saving money in our cleaning department when we purchased fourteen used cleaning mills from a large foundry . . . they turned out to be the most expensive mills we ever purchased. We, last week, placed an order for eight improved mills which will replace the fourteen mentioned above.
>
> *East St. Louis Castings Co.*

> During the past sixty days . . . we thoroughly overhauled all old machinery and added some new. In addition to this we installed a new fireproof lacquer room for our paint-spray work, and had the larger part of the interior of our building repainted, thus relieving the unemployment situation.
>
> *International Harvest Hat Co.*

# Key Men as State Chairmen


**W. H. MEESE**

*Chairman, Fifth District*
*Vice President, Western Electric Co.*

Underwood & Underwood

W. H. MEESE

• District Number 5 of the Federal Reserve Banking System includes the District of Columbia, and the States of Maryland, Virginia, North and South Carolina and all of West Virginia except the counties of Marshall, Ohio, Brooke, Hancock, Wetzel and Tyler. Among the larger centers of population are such cities as Baltimore, Cumberland, Frederick, Hagerstown, Salisbury, Danville, Lynchburg, Norfolk, Petersburg, Portsmouth, Richmond, Roanoke, Bluefield, Charleston, Clarksburg, Huntington, Asheville, Charlotte, Durham, Greensboro, High Point, Raleigh, Rocky Mount, Wilmington, Winston-Salem, Columbia, Greenville, Rock Hill, Spartanburg and Washington, D. C.

Noteworthy is the fact that the Fifth District is not essentially an industrial section. Its basic commodities are coal, cotton, textiles, tobacco and agriculture. It offers, nevertheless, many opportunities for forwarding the work of the industrial rehabilitation movement. The work was officially launched in the Fifth District at Baltimore on October 13 when National Chairman Robertson discussed the scope and import of the movement before a large gathering of the general membership of the Baltimore Association of Commerce. Mr. Robertson's address was broadcast over radio station WFBR.

In effecting the organization of the Committee on Industrial Rehabilitation for the Fifth District we have been particularly fortunate in enlisting state chairmen of such outstanding calibre as to insure splendid supervision in the various commonwealths. The key organization at the present time is as follows:

J. E. Sirrine, vice-chairman,
President, J. E. Sirrine Co.,
Greenville, South Carolina.

J. H. Hanna, chairman for District of Columbia,
President, Capital Traction Co.,
Washington, D. C.

W. F. Brannan, chairman for Maryland,
President, Anchor Post Fence Co.,
Baltimore, Maryland.

H. L. Ferguson, chairman for Virginia,
President, Newport News Shipbuilding & Dry Dock Co.,
Newport News, Virginia.

J. L. Coker, 3d, chairman for South Carolina,
President, Sonoco Products Co.,
Hartsville, South Carolina.

J. M. Crawford, chairman for West Virginia,
President, Parkersburg Rig & Reel Co.,
Parkersburg, West Virginia.

Thurmond Chatham, chairman for North Carolina
President, Chatham Manufacturing Co.
Winston-Salem, North Carolina

Announcements of the appointment of the several chairmen were sent to the editor of every newspaper in their respective states along with a summary detailing the plan of the movement. After the announcements had been published, each chairman called together representative business men in his state and perfected the organization in his specific territory. We have built up the organization in the Fifth District around the prestige and leadership of the state chairmen. We have and shall maintain the work of the movement on a sound and businesslike basis. Nothing unusual except good organizational procedure has been attempted.

While no definite commitments have been reported as being a direct result of our effects, the district is in the process of being thoroughly and intensively canvassed. We believe that personalized solicitation is the best method to pursue.

# Zones Set By Industry Survey

THEODORE SWANN

*Chairman, Sixth District*
*President, The Swann Corporation*

THEODORE SWANN

• The Sixth Federal Reserve District of the United States is comprised of the states of Georgia, Florida and Alabama, and parts of Tennessee, Mississippi and Louisiana. Following the appointment of Theodore Swann of Birmingham, Alabama, as chairman of the committee for this district, L. W. Robert, Jr., of Atlanta, Georgia, was named vice chairman, and a state chairman appointed for each state. An industrial survey was then made of the entire district and the states subdivided into zones with a zone chairman located in the largest city or town in each industrial center. The zone chairmen were requested to organize their districts by industries or businesses and to appoint a sub-chairman for each important local industry. It is the job of these sub-chairmen to enlist the aid of contact men who will go out and preach the gospel of Industrial Rehabilitation.

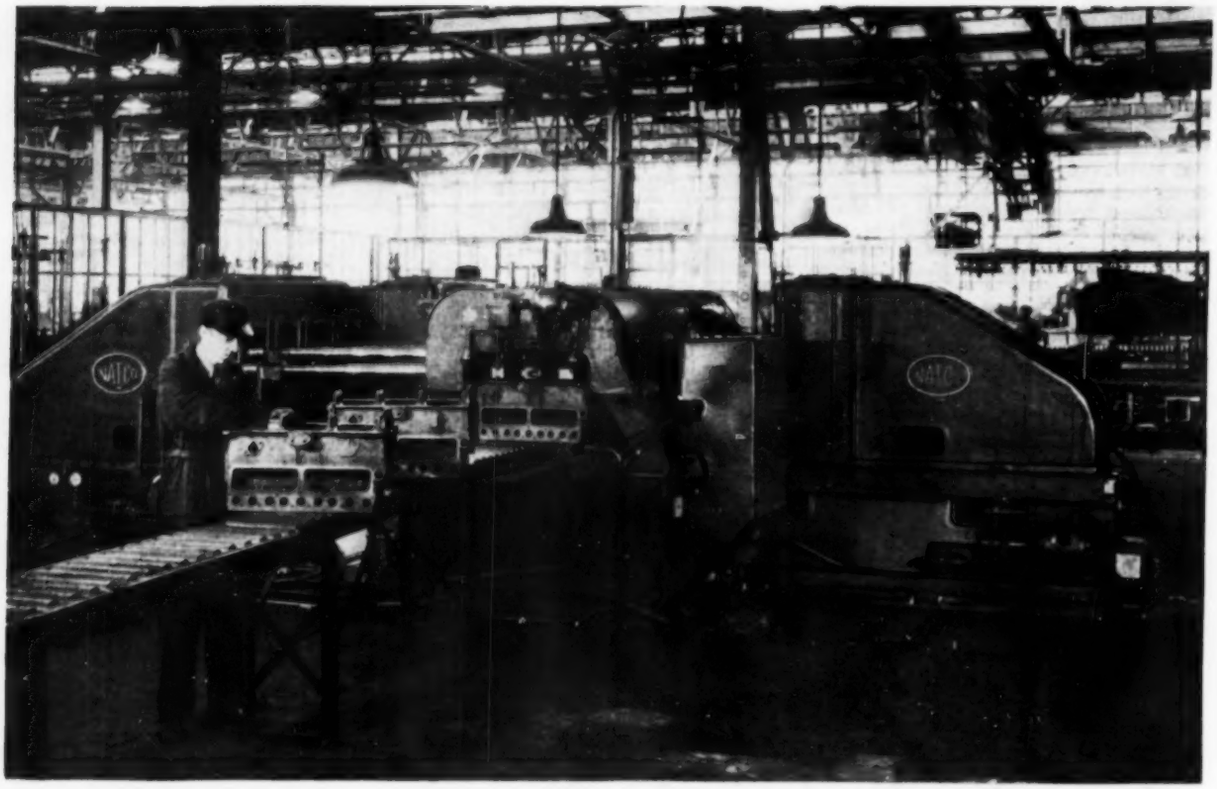
An attempt was made to devise some sort of bogie as a measuring stick for the results that might be expected from the Southeastern states. Based on the value of its manufactures, which is 3.85 per cent of the total for the nation, it was estimated that the quota of rehabilitation expenditure would be $30,800,000. This depends on the assumption that the country as a whole should be spending $800,000,000, about one-sixth of its normal amount.

Dividing this quota up among the states in the proper proportion indicated that Alabama should spend $6,400,000; Florida—$2,400,000; Georgia — $8,000,000; Louisiana—$7,200,000; Mississippi —$2,400,000; Tennessee—$8,000,000. It should be remarked that the last three states do not lie entirely within the Sixth District.

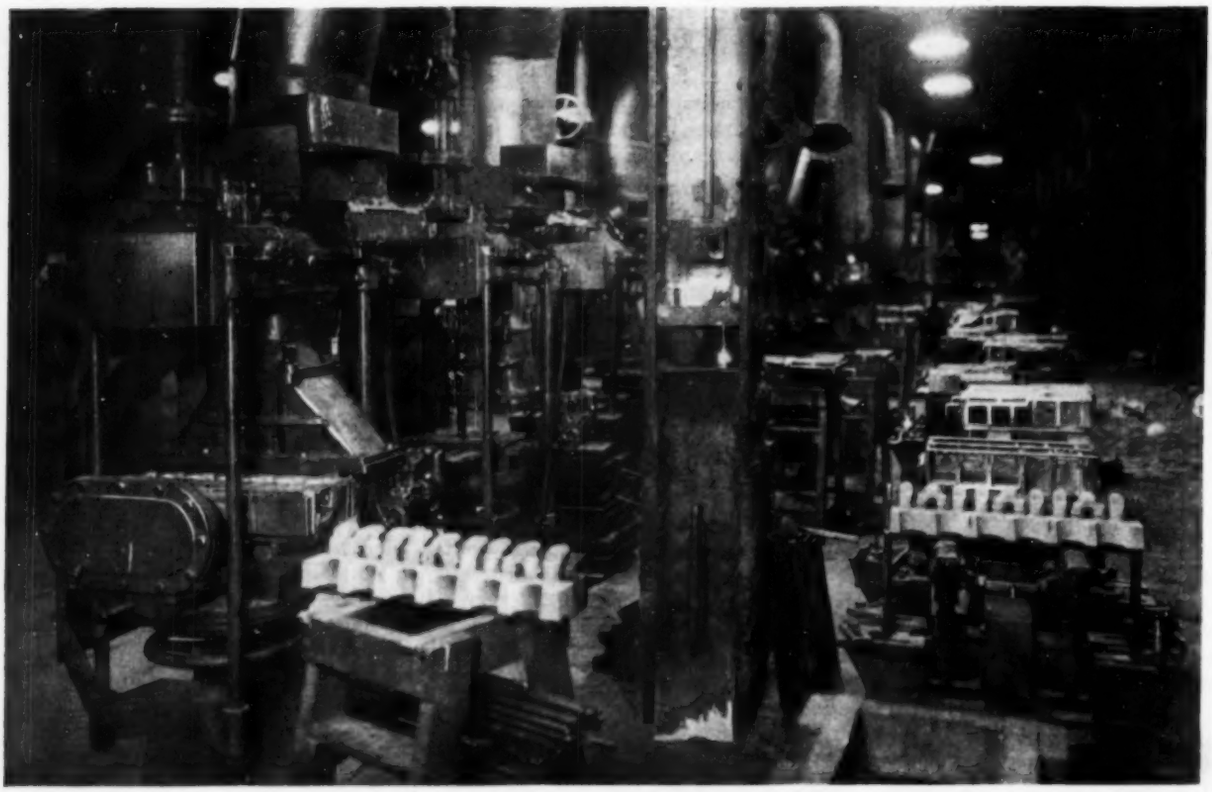
Since the Southern states would benefit but little from money spent for new equipment, because there are so few machinery building plants in the section, some other way of portraying the selfish advantage of rehabilitation was sought. Using the estimate for the money that would be liberated for food through industrial rehabilitation by way of increased payrolls, it was calculated that the six states would receive for food alone: Alabama—$4,000,000; Florida — $5,300,000; Georgia — $6,300,000; Louisiana—$3,700,000; Mississippi—$3,000,000; Tennessee—$5,700,000.

The office of the district chairman has prepared and forwarded to the leading papers in the district, approximately thirty in number, at least three news stories on the movement, and has enlisted the editorial support of some of these journals. With these exceptions, plus securing the cooperation of certain trade magazines, the question of publicity has been referred to the state and zone chairmen. The work of organization has taken considerable time, chiefly because of other economic and charitable programs, but a number of meetings have already been held in some of the larger cities of the district, particularly in Atlanta and New Orleans, and such meetings have been well attended. The district chairman plans to complete within the next few weeks his program of attending at least one meeting in the headquarters city of each state. Stress is being laid on holding luncheons and small gatherings at other times, at which an opportunity will be given for asking questions and discussing definite problems and projects. Since the movement was inaugurated personal contacts have been established with local chambers of commerce and various civic clubs, and these agencies have proved very helpful.

The organization of the Sixth District now seems practically completed and definite reports from various sections are beginning to come in in greater volume. It is hardly possible to determine whether or not credit can be claimed by the Committee on Industrial Rehabilitation for industrial replacements and expansions in this district. It is known, however, that favorable conditions for low costs of materials and equipment and opportunity to increase profits or reduce losses have been important factors in reaching decisions resulting in improvements by private businesses totaling approximately $6,000,000 and public improvements of more than $20,000,000 that have already been reported as now being made or definitely announced for the near future. The classes of private industries affected include paper and cotton mills, rice mills, laundries, restaurants, hotels, dairies, chemical and paint plants, as well as breweries.



A special multiple-unit boring and drilling machine straddles the conveyor and rough and finish bores the camshaft and crankshaft bearing holes in Plymouth blocks. It also core drills and counterbores the welch plug holes



A battery of machines for making air-blown cores multiplies production of various cores and produces a solid core much superior in quality and accuracy to the old hand-made and pasted compound core

# Rehabilitation As Usual

**K. T. KELLER**
*Vice-President and General Manager, Chrysler Corporation*

K. T. KELLER

DURING the past six months the Chrysler Corporation has been putting into effect, as usual, the fundamental principle on which the campaign of Mr. Robertson's Committee on Industrial Rehabilitation is based. As I undestand this principle it means that when a real saving in production cost can be obtained by installing a new machine or a new method, that machine or method should be immediately introduced. I say "as usual" because that has been the corporation policy since I have been familiar with it.

Under present conditions we study every operation with extra care. In some instances it has been found advantageous to have existing machines rebuilt, but generally speaking, the thoroughly up-to-date machine tool operates with an accuracy that cannot be approached by its predecessors of three or four years ago. This point is of the utmost importance because the Chrysler engineering department is now calling for limits of 0.0002 to 0.0005 in. where three years ago 0.001 in. was considered entirely satisfactory. When parts are produced with such accuracy the problems of assembly are greatly simplified.

The demand for manufacturing accuracy is occasioned by the cardinal policy of the corporation to give the purchaser of every one of its automobiles the most for his money, and by so doing to establish a reputation for performance and workmanship that will pay dividends. Under a less exacting policy it would have been entirely possible to get along for another year with existing equipment in the various Chrysler plants. But postponement of the equipment purchases and improved methods that have gone into the plants this year would simply have meant that a much larger outlay would have been necessary next year.

A factory manager can take his choice of two methods of maintaining his plant equipment. Either he can worry along for several years with what he has and then do a complete housecleaning job, or else he can spend what is necessary each year to keep everything in as efficient a state as is economically sound. We believe the latter policy is always the better one. Obviously, the plant that goes into a business slump with its equipment in good shape will be better able to manufacture the reduced volume at lower cost than the plant which has been postponing re-equipment and is caught with a shop full of obsolete machines. It is usually too late then to justify the expenditures for equipment necessary to get manufacturing costs down to a competitive level.

There is still another reason for introducing modern machinery whenever it is economically justified. Experience has shown that new machines will do as much as any other one thing to lift the morale of the machine operators. They are just as proud of a new tool as the executive who ordered it, and they will be far more interested in suggesting better ways of doing things if they feel that the management is alert to improvement, as examplified by its purchase of new tools.

We have gone out of our way in the Chrysler plants to eliminate the man-killing jobs. By doing so we believe that we are sending operators home at night not too tired to enjoy their families or go to the movies, or even to help the market for automobiles by doing their bit toward wearing out the ones that are on the road.

Every executive in the metal-working industry is aware of the trend toward the transfer of skill and accuracy from the operator to the machine. From the production point of view that trend means a steady reduction in the chances for errors and the production of scrap. From the personnel point of view it means that there are more jobs for machine operators because they can be shifted from one type of machine to another, and even from department to department. In times when work is scarce this makes it possible to keep men on the payroll who would otherwise have to be laid off. We have this factor constantly in mind when new equipment is under consideration.

New models in all of the Chrysler lines are now coming through, as is usual at this season. Expense in connection with this sort of development is naturally heavy. It goes for research and engineering development, for rearrangement of plant facilities, for purchases of new equipment, and for the purchase and construction of dies and tools. It has amounted in recent months to something like $9,000,000.

As we see it, such expenditures result in work for many thousands of men, not only in our own plants but in the shops and plants of the manufacturers of equipment and tools, and back of that in the plants of the suppliers of raw materials.

Readers of this article will probably

be more interested, however, in what was spent on the production development and equipment because this expenditure is the sort of thing advocated by the Robertson Committee. Without going too far into detail I can say that most of the nine millions went into dies, tools and equipment.

### Where the Money Went

The largest single item was for body dies, but appreciable sums were spent for new foundry equipment, for machine tools for the motor, transmission and axles; for additional plating equipment for the larger radiator shell; for finishing equipment and rearrangement of the sheet metal finishing department because of the increased demand for fenders, aprons and splashers finished in lacquer colors to harmonize with the bodies; and for additional electric gaging equipment made necessary by the new closer limits already mentioned.

Most of the important machine tools bought for the Plymouth are for motor parts. They include a new manufacturing milling machine for milling the locating spots on the crankshaft, four center-drive lathes for turning the main journals and flange, two hydraulically controlled milling machines for cheeking crankshafts. The crankpin lathes were rebuilt by the maker to accommodate 6-cylinder instead of 4-cylinder engine shafts, and the drilling machines for the oil passages were also rebuilt by the maker to include a recent refinement.

Very considerable savings in block drilling and boring operations were made by two way-type units, a three-way drill and a two-way boring machine. Each of these units turns out 90 blocks an hour and requires but one operator.

Quality was improved in the grinding of the inlet valve seats and the inserted non-burning alloy steel exhaust valve seats by the installation of eccentric valve seat grinders that pilot in the valve stem guide and produce a concentricity of seat and guide within 0.001 in.

Axle shafts are now finished on three centerless grinders at appreciable reductions in cost. Two other centerless grinders with special attachments grind the elliptical aluminum alloy pistons.

On the assembly line all portable tools are now high-cycle, and the feeds are arranged as overhead trolleys so that each tool can be plugged in anywhere along the line.

These are only a few of the high spots but they will serve to illustrate the policy of keeping equipment up to date. What I have said about equipment and methods in the Plymouth plant applies equally to the other plants of the corporation, with this one difference—the change from a 4- to a 6-cylinder engine made possible a more complete rearrangement and re-equipping than would otherwise have been justified. The rearrangement was so complete, as a matter of fact, that of the 1,100 tools left in the motor plant after the obsolete ones had been taken out, 1,100 were moved to a different location. The saving in floor space was considerable. In one department alone, we are now producing the same quantity, with improved quality, in two-thirds of the floor space.

### Foundry Improvements

One foundry, the Dodge foundry, supplies castings for all Chrysler Corporation cars. Here two important innovations have been made. Each involved the purchase of equipment.

The first is the doubled utilization of existing floor space by casting cylinder blocks in pairs in a single flask. The second is the adoption of solid air-blown cores to replace the hand-made, pasted sectional cores formerly used. Output is increased tremendously by this method of core making and the resulting core is far more accurate and uniform.

Corresponding accuracy in patterns and moulding methods has made it possible to reduce the excess metal formerly allowed on bosses and other parts to take care of possible shifting of cores and similar foundry hazards. The sum of these reductions amounts to 15 lb. of iron on each block. Multiply that by the number of motors built and you get quite a tonnage of savings.

I have always felt that the application of machine shop production methods and standards of accuracy to the foundry would pay large dividends on the investment, and this proves it.

### Precision in Bodies

The same reasoning applies to the body department and we are now going ahead with developments there that promise equally satisfactory returns. We have developed a welded jig and work carrier which acts both as a carrier and as a jig sufficiently sturdy to permit metal finishing and welding to be done as the part progresses along an overhead conveyor. We have also developed a station-type machine for assembling and spot-welding body sections that is making large savings. This machine is made up largely of welded structural shapes and would have been prohibitively expensive if designed according to traditional methods.

Does all this investment in equipment pay? I have outlined in some detail the changes in the Plymouth plant as being fairly typical of what is going on in all our plants. Let us take the new Dodge 6 as an example of the kind of savings we are making.

We set out to save a certain amount on this car without reducing quality. When we got all through we found that we had saved an amount 15 per cent in excess of our bogie and had improved quality. This achievement would have been utterly impossible without the investment in the necessary equipment. It convinced us, if we needed any further convincing, that the policy of buying equipment where an actual production cost reduction or quality improvement is possible is entirely sound. We shall continue it.

# Modernizing A Motor Department

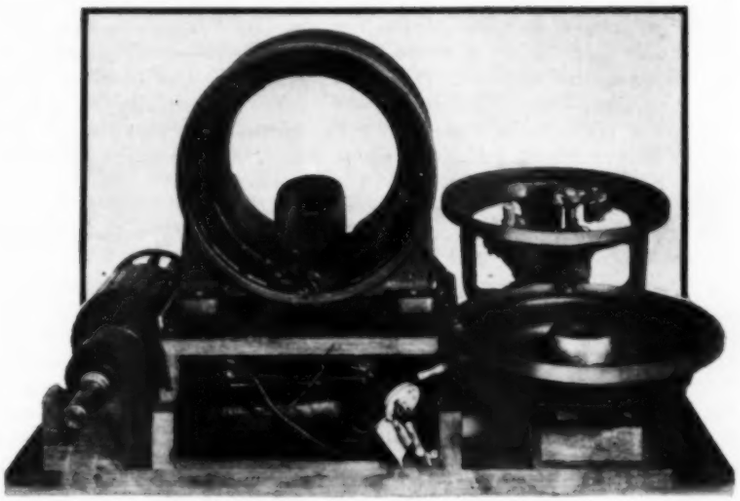


**Fig. 1—Carrier tray with its load of parts which are to be assembled as the tray reaches the operator to which it is assigned**

**M. G. GODSCHALL**

*Tools and Methods Planning Department, General Electric Co., River Works*

THROUGHOUT industry the design of apparatus, manufacturing equipment and production methods are subject to constant changes and improvements. Progressive manufacturers adopt these improvements as they become available, with the result that an arrangement which was highly efficient when it was first made becomes obsolete in a relatively short time. For instance, the new equipment usually has physical dimensions different from that which it replaces; the elimination of operations and processes makes some equipment unnecessary; and changes in methods and sequence of operations upsets the progressive flow of the material in process. Hence it becomes necessary to make a major rearrangement of manufacturing equipment. This article describes such a major rearrangement in the Direct Current Motor Department of the General Electric Co. at Lynn, Mass.

The results which we hoped to obtain from this rearrangement were:

1—Higher quality

2—Improved service to customer

3—Lower manufacturing cost

The name of the department might give the impression that it is a department set up to manufacture one kind of motor. This is true in name only, for of the d.c. motors and generators manufactured there are approximately 2,000 different varieties ranging in weight from 60 to 1,100 lbs.

All varieties, however, are made up of four major parts, the rotating element or armature, the stationary element or magnet frame, and the two end shields or bearing supports. These parts, while similar in the function they perform, are entirely different for each variety in regard to physical size and dimensions. Several varieties of a given part may be made in the same group of machines, but require a different setting of the cutting tools.

This condition calls for the utmost care in scheduling and controlling production through the department so that shipment may be made on time, inventories kept at a minimum, and manufacturing costs kept within reasonable limits.

## Analyzing the Work

The procedure followed in analyzing the work in the factory under discussion was essentially as follows:

1. A detailed study was made of the operations performed on the various parts of a motor from the time the raw material entered the department until it left in the completed motor. This was accomplished by making process flow charts of each part; recording each time the piece of work was acted upon by some force; with the source of that force, whether manual or machine; the type of machine; and the distance traveled in feet, as well as the means of conveyance.

2. Floor plans of existing layout were next made to a scale of ¼ in.—1 ft. showing the detailed outline of each piece of equipment and its physical location in the department, and any special features such as type and size of driving motor, special foundations, etc.

3. With the above list of operations and equipment an analysis of the existing department was made.

a—By drawing on blueprints of the floor plans, lines showing the path of travel of each piece of apparatus from operation to operation through the department. A different colored crayon was used for each type of apparatus.

b—A study was then made of each individual operation to determine if a better way could not be found to do the work. This study was made with the help of the job foreman, the department superintendent, the tool designer and the apparatus engineer.

4. With the above information machine capacities were next determined. Owing to the variety of motors made in this department the individual time required to perform a given operation differed greatly for each variety, and the fact that similar operations for various classes of apparatus were performed on the same machine necessitated the determination of a weighted capacity. This was determined as follows: The pro-

duction records for several years past were studied for each class of apparatus, and from these an average weekly production was determined. A chart was then made for each operation, showing the machine used and the number of hours required each week to produce the part for each variety of motor made on that particular machine. The hours were obtained by multiplying the numbers of pieces to be made per week by the time required per piece, allowing a percentage for lost time. The time per piece was taken from existing time studies, for operations which were to be maintained and from estimated time in cases where it was decided to adopt new methods. The summary of these charts determined the number of machines required for each operation. Owing to the fact that many special motors were constantly being made, and that the ratio of varieties differed to a certain extent from week to week, the actual calculated capacities were increased in certain instances.

With our foundation thus prepared we were ready to start our structure.

The first step was to estimate as nearly as possible the total area which would be required by each subdivision of the department. A block layout of the department was next made placing each subdivision in the most efficient relation to the others in regard to progressive flow of material and shortest distance of travel. The only limiting features of this plan were the walls and permanent fixtures of the building in which it was to be set up.

After a satisfactory general plan had been arrived at we proceeded to make detailed layouts of each subdivision. Templets were made to a scale of ¼ in. = 1 ft. for each piece of equipment, including benches, tables, conveyors, etc., and using the area arrived at in the general plan. Various arrangements were tried until one was found which seemed to possess the greatest possibilities for satisfactory operation. Careful consideration was given to the selection of the proper handling equipment, as well as the relative arrangement of the various pieces of equipment for the most efficient set of motions. Each plan so made was explained in detail to the job foreman, the department superintendent, and the supervisor of stock and production.

### Factory Cooperation

Many valuable suggestions were thus obtained and incorporated in the plan. This plan of consulting the factory men had another very desirable feature. It created in them an interest in the new plan before it actually was put into effect and produced a feeling of cooperation that was greatly appreciated when the installation actually was made. For this reason a suggestion from the factory was always adopted if possible.

After a satisfactory detailed plan was arrived at, a tracing was made of it, from which blueprints could be made for installation purposes. Designs were also made for new equipment and conveyors. A master layout was made to a scale of ⅛ in. = 1 ft. showing the whole department in detail. After all plans were completed, detailed costs and economies were obtained and an appropriation requested to cover the cost of the entire move.

As finally worked out the Direct Current Motor Dept. occupies the entire second floor of our motor building. This floor is approximately 800 ft. long, extending from north to south, and 80 ft. wide, with three towers on the east side, each containing a stairway and a freight elevator.

The plan provided for an aisle along the extreme east side of the building extending along the wall from the north to the south tower, which left available the remaining width of the building as a free area for arranging of equipment and permitted the use of conveyors between machinery, stock and assembly areas without having to cross aisles.

As shown in Fig. 2, the department was divided into four major areas, starting with the north or Western Ave. end of the building.

A—Mechanical Parts of Rotating Element

1—Shaft
2—Core
3—Commutator

B—All Electrical Parts, Rotating and Stationary

4—Armature coil winding
5—Armature winding
6—Armature and field coil, baking ovens, insulation stock
7—Field coil
8—Armature finishing

C—Stationary Mechanical Parts

9—Leads—brush rigging
10—End shield
11—Magnet frame

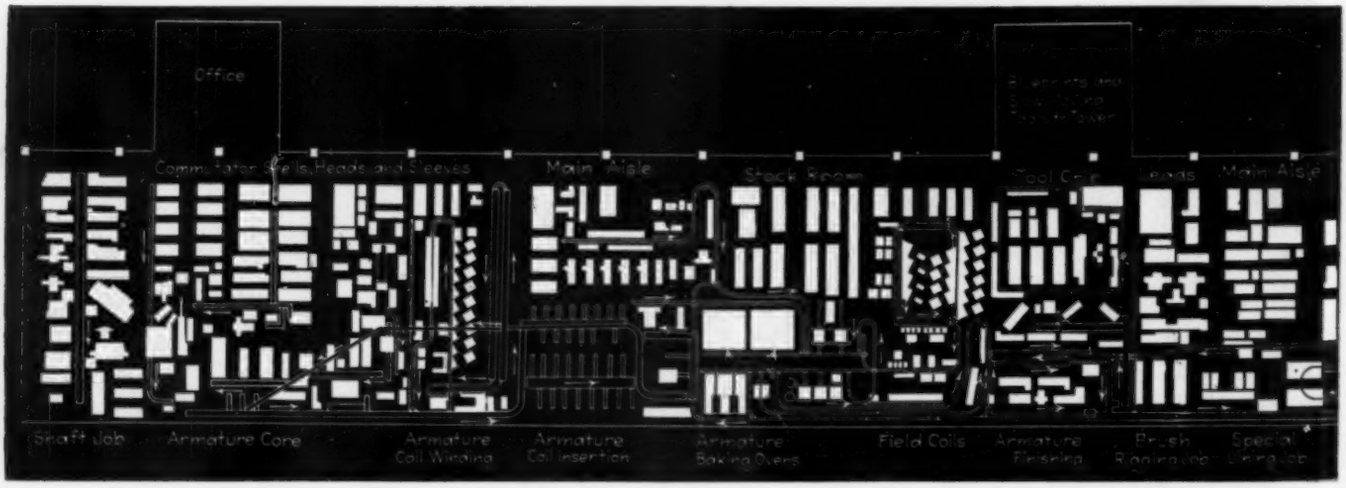
D—Accumulation of Parts and Finishing Operation

12—Stock and assembly
13—Test
14—Paint
15—Crate and ship

Partitions 8 ft. high were placed between adjoining sections to prevent chips or metal parts from damaging the electrical elements.

In general all movement of material in the department is: up the elevators on trailer trucks, south along the main aisle

Fig. 2—New D.C. Motor Department at Lynn occupies half the former



to the proper area, then west through the processing operations to inspection, and finally south on the conveyor along the west wall to stock assembly test and paint. Crated motors are taken down the elevator in the south tower on trailer trucks to the shipping department.

Throughout this plan mechanical handling has been used wherever possible, thus keeping work in process off the floor and moving according to a carefully worked out schedule. Conveyors have been used almost entirely for transportation of material in process and finished material. The types of conveyors in use are as follows:

1—Gravity roll
2—Live roll
3—Power belt
4—Power apron
5—Overhead monorail
6—Overhead power chain
7—Floor-operated overhead electric crane

A trailer truck system is used to transport raw material from the contributing departments up the elevators to the various processing areas.

All stock areas are adjacent to the aisle and space is provided for trailer trucks at each area. Space is also provided for trailer trucks opposite each elevator, so that there is no excuse for violation of the strict rule that the aisle must be kept clear.

Shafts are made in economical lots, as far as possible, to avoid excessive set up costs and are stored in metal racks adjacent to the inspection bench. Special shafts are made as required but are handled in a manner similar to the standards. Shaft stock is delivered to the semi-automatic turning machines on skid platforms. After turning, the shafts are placed in a tray which operates on a double width section of gravity roll conveyor. This conveyor extends through the job past the milling and grinding operations to the inspection bench. The tray is designed to hold a quantity of shafts which can readily be handled on the conveyor and the double width conveyor permits the shunting of rush orders around the normal production.

Core punchings are brought from the punch press department in another building via the trailer truck system and transferred to a series of stock bins adjacent to the aisle. Punchings, too, are made in economical quantities as far as possible, but the production is so scheduled that only a few days' supply of punchings is in the bins at any one time.

Cores are made up from these punchings only as required, absolutely no stock of built up cores is carried.

### Commutators as Needed

Commutators are made up as required in most cases, a few being carried for the varieties of motors having an appreciable demand. Commutators are carried from operation to operation on trays operating on gravity roll conveyor. Finished commutators are inspected and placed on an accumulation rack to await assembly to the shaft and core.

The shaft, core and commutator are assembled in a hydraulic press located at the junction of these three jobs. The production scheduling for the core and commutator is such that they meet at this press within a few minutes of each other.

The assembled core is placed on a two posted conveyor tray by the press operator. This tray serves as a conveyor tray and a work bench for subsequent operations. Thus it passes through several inspection operations and is finally taken through an opening in the wooden partition to the electrical department and past the armature coil winding area to the head of the armature winding or coil inserting area by a live roll conveyor. Here the prewound coils are placed on the tray and it is assigned to a definite operator. This winding area is made up of triple width conveyor sections with stub sections extending off on either side on which the trays are drawn for the coil inserting operation. The two outer lines act as an accumulation area for work ahead of the operators. The center line is kept open for transportation of wound armatures to the succeeding operations of test, solder and band.

At the banding operation the armatures are lifted from the conveyor tray to the banding machine by an electric hoist.

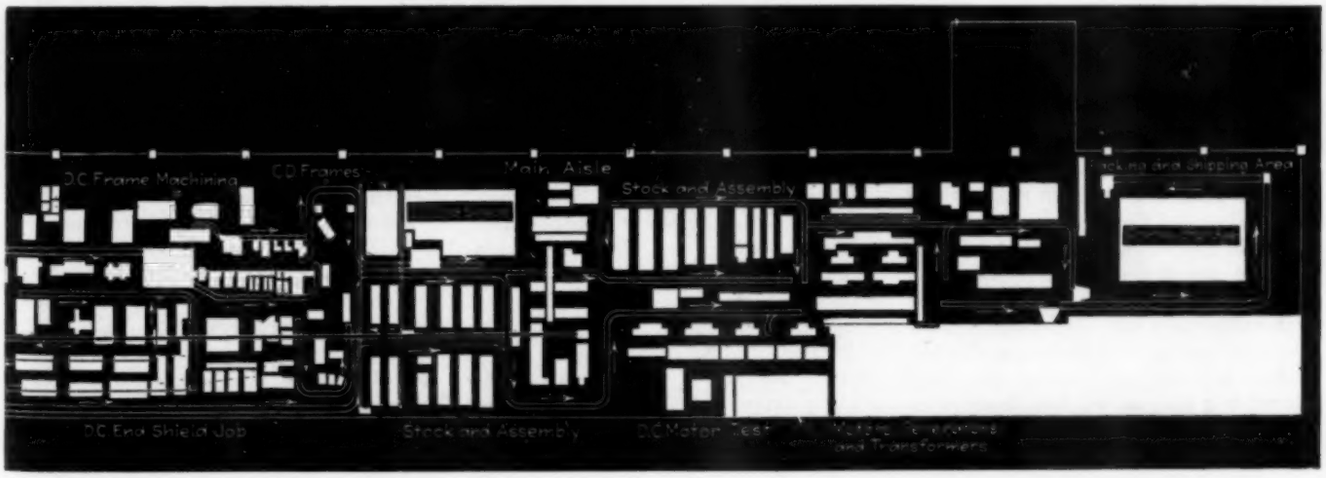
This is the first time the armature has been taken from the tray since the operator at the hydraulic press placed it there. In this way handling and consequent danger of damage is kept at a minimum.

In the armature coil winding area two overhead power chain conveyors are used and are provided with suitable hooks to handle the coils in sets. Wire stock on reels and spools is brought up the north elevator via the trailer truck system and is transferred to stock racks located adjacent to the aisle.

The wire and winding form is delivered to the winder, who winds a set of coils, tags them for the next operation, and then places them on a conveyor hook. The operations performed and the sequence in which they are performed differs greatly for the different varieties of coils wound. Hence the use of a continuous overhead chain conveyor. This type of conveyor also keeps the coils up in the air away from any possible damage.

After a set of coils is completed it is inspected and placed in an accumulation rack over the core feeder conveyor to

**space and is arranged all on one side of the main aisle**



await the core. Again the production is so scheduled that the coils precede the core by not more than a few minutes, thus eliminating the possibility of damage in handling or storage.

To go back to the wound armature, the operator at the banding machine lifts the armature with an electric hoist to a hanger on an overhead trolley monorail system for transportation through the dipping and baking operations and on to the armature finishing section. The tray used up to this point is placed in an electrically operated elevator, lifted to an elevated section of power belt and gravity roll conveyor and carried back to the core assembly press ready for another core.

After the oven treatment the armature is pushed along the monorail to a cooling area and thence to the armature finishing area. At the first operation in this area the armature is lifted from the monorail carrier to a tray, Fig. 1, similar to that used in the winding area. This tray is used from this point on until the armature is assembled in the motor. The monorail carrier is lifted by elevator to a return track, which takes it back to the banding machines.

The cooling area is separated into three parallel lines to expedite production and segregate the different varieties into similar groups as far as possible. At the end of this area the armature is given a thorough inspection both mechanically and electrically, and is then pushed onto the steel pallet transportation conveyor for conveyance to the stock and assembly area. At the same time the inspector notifies the attendant in the finished part stock area by use of a remote control recording device that the armature is on its way. This gives the attendant approximately twenty minutes in which to accumulate the other parts for that particular motor and make ready for assembly.

The methods used in winding field coils are similar to those used in the armature coil winding area with the exception that the equipment is heavier because the coils are heavier. For this reason the coils are carried on steel trays operating on power belt and gravity roll conveyors. These are arranged to form a continuous conveyor to provide for the different sequences of operations of different varieties of field coils.

Field coils are varnish treated and oven baked and the equipment for doing this is in the same area as that used for treating armatures, thus consolidating these similar operations into one area and minimizing the fire hazard. After the oven treatment the coils are cleaned, tested, and inspected, and are then placed in a tray on the long transportation conveyor to go to the stock and assembly area. The inspector notifies the stock attendant by the remote control recording device as in the case of the armature.

Finished field coils are scheduled to arrive at the stock and assembly area just ahead of the armature. A small quantity of finished coils is kept in stock for standard motors which have an appreciable production.

End shield castings are brought into the machining area via the trailer truck system and placed beside the machine on which they are to be turned. An overhead power chain conveyor takes the end shields from the machines to the inspection bench, thus saving the floor space required for gravity roll and eliminating piling on the floor. Because of their weight, a gravity roll conveyor is provided for special motor end shields.

Several lines of drills have been provided to take care of the different varieties, and gravity roll conveyors have been installed to permit special parts to by-pass standard parts in process. After the drilling operation the miscellaneous parts such as lining, oil well covers, etc., are assembled, and the end shield is once more inspected, after which it is pushed to the power transportation conveyor to go to the stock area. Standard end shields are made up in economical quantities and are carried on a maximum-minimum stock basis.

Magnet frames are handled in a manner similar to end shields except that gravity roll conveyor is used throughout the job. These, too, are made up in economical quantities and stored on a maximum-minimum basis in the finished stock area. By-pass conveyors are also provided in this area to shunt special parts around standard work in process.

The finished stock area is divided into two general groups: Parts for the larger sized standard and all special motors are carried in one area; parts for the smaller standard motors are carried in the other area.

A stock checker is stationed at the discharge end of the long transportation conveyor and makes a record of each piece as it comes through. He has already had advance notice on the armature and field coil through the recording device operated by the inspector at the opposite end of the conveyor.

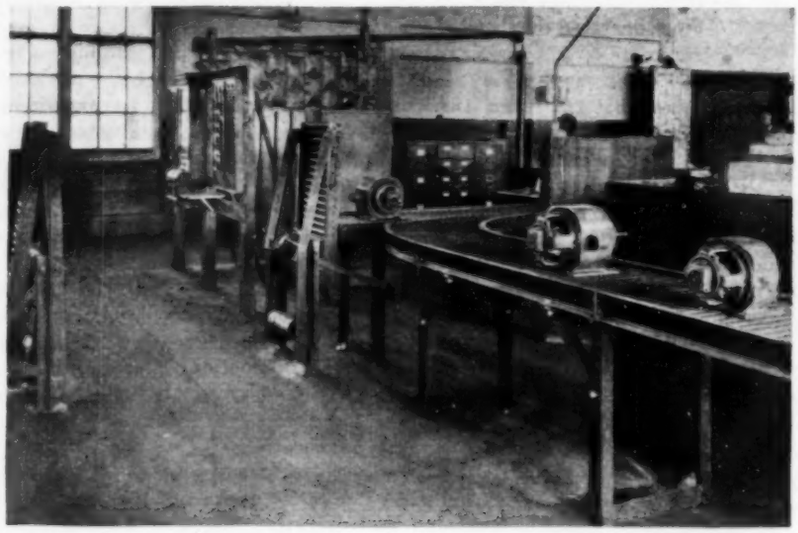


**Fig. 3—Two types of motors, one of which requires a bench test, rejoin the main line conveyor at the junction point. From this station both types proceed to the painting section for finishing**

The armature requires the longest time of any part of the motor to make, so that when word is received that a certain armature is en route to the stock area, the attendant immediately checks for the other parts of the motor, and if all are on hand, has them accumulated and pushed along the gravity roll conveyor to the accumulation conveyor before the assembly area.

The assembly for this group of motors is divided into two areas; one for standard motors consisting of a line of gravity roll conveyors on which the assembly operations are performed, the other containing a series of benches on which the special motors are assembled. This latter area is serviced by a floor operated high speed electric crane equipped with push button control. The special parts

are lifted from the accumulation conveyor to the assembly benches by the floor operated crane. The assembled motors proceed to the inspection and high potential test conveyor which is a continuation of the standard assembly conveyor. The special motors are lifted to the conveyor by the floor operated electric crane.

The trays on which the armatures and field coils were handled are placed in an electrically operated elevator and lifted to an elevated section of power belt conveyor which returns them to the armature finishing and field coil jobs for further use.

All motors handled in this area are given a bench test and are therefore lifted from the conveyor to the bench to the gravity roll conveyor and the tray to a return section of conveyor without having to lift either.

One variety of motor continues through test on the conveyor, and another requiring a bench test is sent to the previously mentioned test area via a by-pass conveyor for a bench test, Fig. 3, after which it is placed back on the gravity roll conveyor for preparation for painting.

The division between the small and the large sized motors is carried through the painting operation. From that point on all motors are handled on the same conveyor. Gravity roll conveyor is used throughout except for a small section of power conveyor for drying paint.

The painting operation is performed

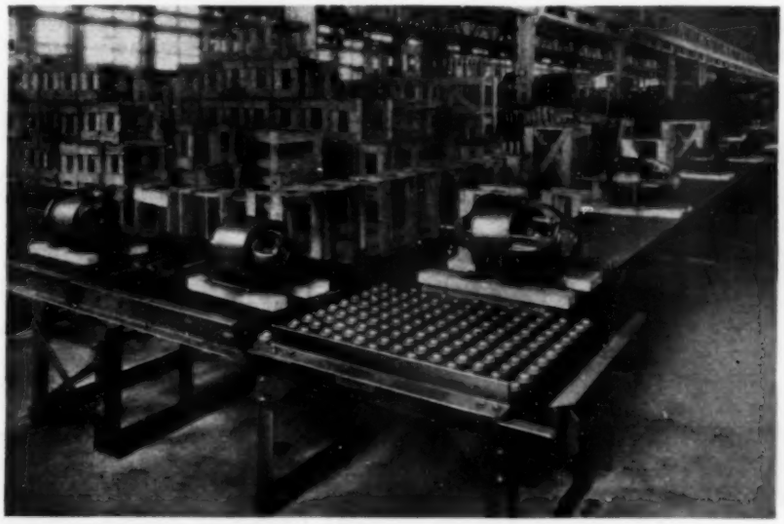


**Fig. 4—Finished motors on skids reach the end of the assembly line over wide-spaced rollers. Being easier to crate if turned 90 deg., they are transferred to a narrow-spaced roller conveyor by a ball table**

by another floor operated crane. After test they are lifted to another section of conveyor for preparation for painting.

The stock and assembly for the smaller standard motors is in a self contained area surrounded by gravity roll conveyor. On the west side the conveyor is double decked. Incoming stock from the long transportation conveyor is received on the lower section, while parts for assembly are collected on special assembly trays on the upper section. From this section the trays proceed down an inclined section of conveyor to the assembly area, where the motors are assembled progressively, the trays acting as assembly benches.

After assembly and inspection a specially constructed transfer section permits transferring the motor from the tray in a hood equipped with a suction blower and suitable screen filter to trap the paint in the air. Two hoods are provided, so arranged that they are both adjacent to the power section.

The motors to be painted are lifted from the conveyor to a suitable painting position in the hood by means of another floor operated electric crane with push button control. The same crane serves both paint hoods.

While the motor is suspended at the hood the crate skids are attached to the motor feet, thus saving a lifting operation in the crating area. The motor is then placed on the power section of conveyor, which allows the paint to dry and at the same time elevates the motor slightly.

This power section discharges on an inclined section of gravity roll which provides a slight accumulation before the final operations.

Through this area the motor proceeds with the crate skids lengthwise with the conveyor, thus permitting fairly wide spacing of conveyor rolls. From this section the motors are pushed to the crating conveyor.

For convenience in crating it is desirable to have the crate skids extend across the conveyor, therefore a ball transfer table was placed at the intersection of these two conveyors, Fig. 4. The construction of the building required a ninety degree turn in the conveyor line at this point, so the ball table permitted the combining of the two moving operations into one.

The crating conveyor is made of heavy duty rolls closely spaced to permit the skids to operate over them in the crosswise position. A dial scale is built into the discharge end of this conveyor for the purpose of weighing the crated motors.

Another floor operated electric crane with push button control is used to lift the crated motors from the conveyor to a trailer truck for transportation down the elevator to the shipping department.

The concentration of all major functions for the manufacture of a motor in one area, along with balanced capacities, definite paths of travel for the work and adequate handling facilities have produced the following advantages:

1. Reduced the distance traveled in process of manufacturing a d.c. motor 35 per cent. In terms of normal production this would mean a saving of 13,200 miles per year.

2. Reduced the departmental floor area by 11 per cent.

3. Reduced the floor area assigned to storage of finished parts 44 per cent.

4. Reduced inventory of material in process 10 per cent.

5. Shortened overall time required to make a motor 20 per cent.

6. Reduced the spoilage by elimination of excess handling and reduction in inventory.

7. Reduced power, heat and light charges and capital investment due to use of smaller area and elimination of unnecessary equipment.

8. Savings were also made in the following expense items:

a—Supervision
b—Inspection
c—Elevator and crane men
d—Stock keepers and helpers
e—Material accumulators
f—Helpers and laborers
g—Shop clerks

# A Replacement Policy and the Depression

**JAMES E. GLEASON**
*President, Gleason Works*

A PROGRESSIVE replacement policy in a machine shop should be so planned that a business depression will not affect it materially. It is easier to replace equipment from year to year than to wait until a rapidly advancing state of obsolescence makes a very large single expenditure necessary. During times of economic stress the pressure on shop executives for reduced costs is heaviest, and the shop which has the advantage of modern equipment can produce to the best advantage.

For many years the Gleason Works has tried to keep its plant modern and efficient by purchasing a certain amount of new machinery and equipment each year, and from the following analysis of purchases during the last three years of depression it will be seen that this policy of continuous replacement has been carried out. But before coming to the transactions of the years of depression it may be well to review briefly what happened from 1927 to 1929, years of increasing prosperity.

Replacements of machinery in percentage of total investment in 1927 were 9 per cent, the face value of the discarded equipment amounting to 70 per cent of the new purchases. In 1928, replacements equaled 14 per cent of the total investment, the face value of the discarded equipment amounting to 50 per cent of the purchases. Similarly, in 1929, purchases equaled 17 per cent of the total investment, while the face value of discarded equipment equaled 70 per cent of the purchases. During this

*Furlong*

JAMES E. GLEASON

period there were of course additions to equipment and changes in buildings. However, in the case of a company building machine tools the machinery is the largest factor in the plant and so these figures have been confined to machinery.

When the depression struck in 1929 there was immediately a large surplus of machinery which could not be kept in operation and which, because of the heavy purchasing program of 1927, 1928 and 1929, was in most respects quite up to date. It is the purpose of this article to tell in some detail what purchases were made in 1930, 1931 and 1932 and what influenced these purchases.

A major project started and completed during the depression period was a new building especially constructed and equipped for priming, filling, rubbing, and sealing of castings. This is a single story building, 40 ft. by 112 ft. by 15 ft. in height, completely equipped with the latest types of spray booths, mechanical sanding devices, buffers, grinders and allied equipment.

The reason for the project was the desire of the management to promote the health and efficiency of the workers by obtaining the best possible conditions of hygiene and working comfort through modern air conditioning equipment. Reduction of handling costs and increased efficiency of supervision through centralization of all painting activities have resulted from this change.

A study of lathe costs leading to a practically complete replacement of engine lathes was started in 1929 and completed in 1930. It was found possible to save time, floor space, power and maintenance costs by replacing approximately 30 old lathes with 12 new machines.

A battery of five large vertical-spindle surface grinders was replaced by the latest machines. In this case larger motors and improved design features resulted in a production saving of about 20 per cent. Repair costs, which were becoming a considerable factor of expense, were of course practically eliminated.

The following list with explanatory notes is illustrative of some of the other machine purchases:

Gear Shaper—Increased production rate 60 per cent, replacing three old machines.

Hand Millers—Three worn out machines were replaced. New machines are heavier and faster.

2-Spindle Drill—The electric tapping feature materially increased production on small work.

14-in. Cylindrical Grinder — Sturdy construction and greater power increased production 50 per cent over old style machine. This machine replaced two old grinders.

Vertical Turret Lathe—Improved construction and design features (such as the spiral bevel table drive and a universal forming attachment) resulted in a production saving of 30 per cent over the boring mill which it superseded.

High-speed Cut-off Machine—Replacement of cut-off machine by high-speed abrasive cut-off machine decreased by 80 per cent the time of cutting off small pieces.

Horizontal Boring Machine—An old design horizontal boring machine was replaced with a new machine with greater range, improved spindle construction, higher spindle speeds and other improvements. A dial indicator indexing device made possible accurate boring of jigs and special parts at a materially lower cost over previous methods.

Surface Grinders—The replacement of two planer-type surface grinders with

new machines resulted in production and maintenance savings. Hydraulic reversing, anti-friction spindle bearings and faster table speeds are features which contribute to this result.

Foundry Equipment—Two new style jolt roll-over pattern draw molding machines replaced two old machines. The new machines produce better molds and turn out 25 per cent more production.

The business of the Gleason Works necessitates the operation of a department devoted to bevel, spiral bevel and hypoid gear cutting, testing and lapping, mainly for sample gears, special gears, development and experimental work. The equipment in this division has been largely replaced since 1929. The savings made illustrate the tremendous advancement in machine tool productivity in the past three years. The new design 3-in. straight and 3-in. spiral machines are 30 per cent to 50 per cent faster than the old design machines which they replace, the 12-in. generator 50 per cent faster, and the No. 7 and No. 16 spiral machines 60 per cent faster. New models of testing and lapping machines have been installed, including a univeral test machine for testing bevel, spur, helical, internal and worm gears. The No. 40 spiral generator is a new machine for generating large spiral bevel gears, supplementing the 60-in. and 90-in. sizes, and for gears within its range is 20 per cent faster than the larger machines.

In the heat-treating department the replacement policy has resulted in the installation of a new salt-bath furnace for hardening high speed steel. This gives a much greater uniformity of hardness and eliminates surface decarburization. An improved drawing furnace has also been installed in this connection.

The general shop equipment has been modernized in many instances. Lift trucks have been replaced, reducing delays and repair costs. An important labor saving resulted from changing several cranes from cab control to floor control.

### Replacement is Good Business

Summarizing this discussion, it has been found that the continual replacement of equipment during the depression period has proved to be good business. Each proposed replacement was carefully analyzed and the possible savings computed before purchases were made. Improvements in quality of product as well as cost were especially considered. While the volume of business has of course decreased it is even more important to produce on a minimum cost basis. When an upturn does come, the plant is ready for immediate operation on an efficient basis.

# Five Rehabilitation Reasons

## Buying to Make Both Direct and Indirect Savings

C. H. Bivin
*Assistant Superintendent*
*Sunbeam Electric Manufacturing Co.*

• Equipment replacement often brings with it indirect savings that compare favorably with the direct savings that justify the investment. We recently encountered such an instance where equipment for boring and facing the bronze bushing in a small cylinder head were the operations to be performed.

At the outset to maintain our daily quota on one part under old methods, we were faced with the necessity of installing several new machine tools, the cost of which would have equaled that of the single automatic boring machine which we finally purchased.

Production on the existing equipment was 11 per hr., two machine units operating 22 hr. per day. The new machine stepped up production to 40 an hour, and relieved three operators for other work. At 65 cents an hour the daily direct saving is appreciable.

But in conjunction with the old method we were obliged to use reamers to obtain the desired quality of finish, and within the size limit of 0.0003 in. The new boring machine eliminated the reaming operation.

It has been necessary for us to have a full time toolmaker on the day shift, just for the upkeep and making of these reamers; also a toolmaker at night, who devoted half his time to reamer upkeep. A new reamer was necessary approximately every 600 pieces processed, and due to the extremely close limits and the abrasive nature of the piece reamed, had to be reground about every six to eight pieces, which fact made it necessary for us to have quite a stock of reamers on hand. Each reamer cost $5.00, and roughly speaking, one was worn out every day and one-half. Considering that toolroom wages were 75 cents per hour, this one item, not adding burden, ran into sizeable figures.

On the strength of the saving which accrued to the company from this one part only, the purchase of the new machine would have been justified. However, we process two additional pieces of the assembly simultaneously with this part, thus making a considerable additional saving.

Briefly, the company policy concerning new equipment has been that any guaranteed saving of 15 per cent in operating and processing cost would warrant the purchase of new equipment.

## Buying for Immediate and Future Needs

*President*
*The Standard Stoker Company, Inc.*

• Under the industrial conditions that have prevailed for the past several years, the purchase of machinery or plant equipment must fall in one of two classes. Either it must show beneficial results based upon present output or, in some instances, it may be warranted as a preparation for increased volume under those improved business conditions to which we all look forward in either the proximate or ultimate future.

In our business, which is largely that of the manufacture of mechanical stokers for railway locomotives, we have made purchases for both of these purposes, although, of course, on account of the severe economic conditions, more than ordinary care has had to be exercised. In 1931 we bought two modern turret lathes, believing then that even under the reduced volume of business their purchase was warranted. This purchase has worked out satisfactorily and we feel that it was wise.

At the time these tools were purchased, the builder made a survey of our machining operations that he felt could be advantageously performed on turret lathes and pointed out that three additional units could be used to advantage if and when an increase of business came. We did not at that time feel justified in buying these additional lathes because we did not have work to assign to them. We have now arranged to get these three tools because we feel that a certain betterment of business conditions will undoubtedly come before long and also because we have made an arrangement

with the builder under which we initiate payment for these machines, on an instalment plan, when they are put into operation.

While we do not have work for them at the present time we have them in place ready for operation without the considerable delays that would come if sudden and unexpected demands were made upon us, and at the same time we were enabled to make the installation carefully and without haste. There was no locomotive business in the year 1932, but under all the conditions we think it fair to assume that there will be a fairly substantial business along this line during the coming year, and in so far as these particular tools are concerned we have made ourselves ready to meet the demands of our customers. We have gone along now for the last two years making comparatively small investments in tool replacement, but just as soon as any uplift in business comes we shall have to invest substantial amounts for this purpose. I think that many other manufacturers are in this same position, and therefore feel that with the first real uplift in business the tool companies will get their full share, or possibly more than their full share.

### Out of Savings

We recently made another plant addition which is worthy of mention as indicating the change that has been brought about in sales methods through the conditions of depression which have existed. For quite some time we have felt the advisability of putting a wire fence around our plant, but could not see our way clear to the immobilization of capital at this time for such a purpose. By erecting this fence we can save the wages of two watchmen, amounting to $250 per month. We took this matter up with one of the leading fence manufacturers, received a bid from them upon the work, and then proposed that we should pay for the fence at the rate of $250 per month, in this manner providing for a capital expenditure out of current savings.

We have once again in this instance, of course, the old vicious circle of spending money upon capital improvements, and thereby helping general trade conditions, at the expense of employment. In this particular instance it will not work out in this way, as these men can be given other duties. I feel, however, that the business world has got to face this vicious-circle problem, and personally I cannot see any solution for it excepting a reduction of the average length of the working day, with, of course, a fitting and proper increase of wage rate.

## Buying to Improve Quality

E. BARGER
*Factory Manager, Copeland Products, Inc.*

• In the building of refrigerators the quality of machined surfaces is so vital to the satisfactory functioning of the complete unit that it is sound sense to install the very best available equipment. A recent installation of a tungsten carbide equipped automatic boring machine showed very clearly the wisdom of such a policy, and also that the maintenance of rigid standards of quality does not necessarily result in prohibitive costs, provided you have the right equipment.

The machine was tooled with tungsten carbide cutters to bore the two ends of the compressor crankcase, the crankcase end cover, and the babbitted big end and the bronze-bushed small end of the connecting rod. Average production is 47 of each of these parts per hour. Tolerances on the various holes run from 0.0002 in. to 0.0005 in.

In spite of the fact that we have very materially improved the quality of the product machined on this equipment, we have decreased the cost of our machine operations as a result of improved methods, in an amount of approximately 60 per cent, and due to these savings we can naturally pass on to the potential purchaser a product of higher quality, at lower cost.

It might be well to consider the fact that not only is the improvement in the product noticeable at the start, but that its life has been materially lengthened and service expense has been minimized; all of course being beneficial to the building of good will and increasing public demand.

## Buying to Reduce Manufacturing Cost on a New Product

JOHN B. LUKEY
*D. O. James Manufacturing Co.*

• When we started manufacture of the new three-part coupling announced recently in *American Machinist*, it was evident that production cost would be too high if we employed equipment which we had available. Accordingly we purchased a vertical milling machine equipped with tungsten carbide cutters by the builder and speeded correspondingly. The operations performed are two: face milling the bottom of the channeled side members of the coupling; and straddle milling of the sides of these members.

Comparative figures on old and new equipment show why the replacement was justified. On the new machine with TC cutters the table feed is 17 in. per min. On the old machine with high speed steel cutter it was 4 in. per min. The material is a nickel-bearing iron.

For each operation the production time has been decreased at least 75 per cent. In addition, we have found other jobs that can be assigned to the new machine and on which similar savings are possible.

Obviously, it was good business to install this new unit. As the necessity presents itself we plan to make other replacements where any such savings are possible.

## Buying to Build Smaller Lots

R. WARD
*Production Engineer, International Motor Co.*

• For several years all of the gear grinding at the Plainfield Works of the International Motor Co. has been done on special machines designed and built by our own engineers. Although they have been improved from time to time as their limitations became apparent, these machines were originally designed as single-purpose units and were consequently somewhat limited as to size, variation in angle and variation in pitch.

The objections mentioned were minor ones, however, compared to the big one of extended set-up time. So long as gears came through in lots of 500 to 1,000 this objection was not so serious, but now that we are grinding lots as small as 50 at a time it is prohibitive.

We were faced with two alternatives, to rebuild our special machines to make them more flexible, or to install standard commercial gear grinders. A study showed that the latter course would be the wiser one and we accordingly ordered one machine. It was so successful that a second was ordered later.

On these new machines the time per tooth is greater but the set-up time is so very much less—a matter of an hour or two instead of a day or more—that the time per gear is much less. The result has been that most of our gear grinding has been assigned to the two new machines, only the amount beyond their capacity going to the older units.

I believe that many plants would find it profitable to study the performance of their existing equipment to see what effect the smaller lots of today have on its efficiency as compared with the efficiency of some of the newest machines.

American Machinist
Reference Book Sheet

# Check Sheet of Production Equipment

THIS form was devised to facilitate a check of production equipment and thus to indicate those units which are most wasteful and hence in most urgent need of replacement. After these have been determined, a more careful analysis covering a variety of typical jobs with direct comparison between existing and modern equipment should be made. A form such as that illustrated in the Warner & Swasey entry to American Machinist's Equipment Policy Award for 1931 may be found useful (*AM*—Vol. 75, page 839).

A start with this check sheet will serve to locate outstanding manufacturing efficiencies. For the sake of simplicity, such items as interest charges and savings in maintenance expense have been omitted. The investment in new equipment should, of course, include costs of installation, tooling and attachments.

| Type of Equipment | Make and Size | | Average Cost per Piece | | Anticipated Monthly Production Requirements | Savings | | Investment New Equip. | Resale Value Old Equip. | Months Needed to Pay for Itself |
|---|---|---|---|---|---|---|---|---|---|---|
| | Old | New | Old Equip. | New Equip. | | Per Piece | Per Month | | | |
| **Bending machines** | | | | | | | | | | |
| **Boring machines** | | | | | | | | | | |
| Horizontal | | | | | | | | | | |
| Vertical | | | | | | | | | | |
| | | | | | | | | | | |
| **Broaching machines** | | | | | | | | | | |
| **Centering machines** | | | | | | | | | | |
| **Cutting-off machines** | | | | | | | | | | |
| **Drilling machines** | | | | | | | | | | |
| Horizontal | | | | | | | | | | |
| Vertical | | | | | | | | | | |
| Radial | | | | | | | | | | |
| | | | | | | | | | | |
| **Honing machines** | | | | | | | | | | |
| **Forging machines** | | | | | | | | | | |
| **Gear-cutting machines** | | | | | | | | | | |
| | | | | | | | | | | |
| **Grinding machines** | | | | | | | | | | |
| Cutter and tool | | | | | | | | | | |
| Cylindrical | | | | | | | | | | |
| Surface | | | | | | | | | | |
| Internal | | | | | | | | | | |
| | | | | | | | | | | |
| **Hammers** | | | | | | | | | | |
| **Keyseaters** | | | | | | | | | | |
| **Lathes** | | | | | | | | | | |
| Engine | | | | | | | | | | |
| Turret | | | | | | | | | | |
| Automatic | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| **Lapping machines** | | | | | | | | | | |
| **Milling machines** | | | | | | | | | | |
| Horizontal | | | | | | | | | | |
| Vertical | | | | | | | | | | |
| Planer type | | | | | | | | | | |
| | | | | | | | | | | |

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Reference Book Sheet

# Check Sheet of Production Equipment

| Type of Equipment | Make and Size | | Average Cost per Piece | | Anticipated Monthly Production Requirements | Savings | | Investment New Equip. | Resale Value Old Equip. | Months Needed to Pay for Itself |
|---|---|---|---|---|---|---|---|---|---|---|
| | Old | New | Old Equip. | New Equip. | | Per Piece | Per Month | | | |
| **Planers** | | | | | | | | | | |
| **Pipe cutting and threading** | | | | | | | | | | |
| **Presses** | | | | | | | | | | |
| | | | | | | | | | | |
| **Riveting machines** | | | | | | | | | | |
| **Shapers** | | | | | | | | | | |
| **Shears** | | | | | | | | | | |
| **Slotters** | | | | | | | | | | |
| **Threading machines** | | | | | | | | | | |
| **Welding machines** | | | | | | | | | | |
| **Welding outfits** | | | | | | | | | | |
| | | | | | | | | | | |
| **Portable tools** | | | | | | | | | | |
| Drills | | | | | | | | | | |
| Grinders | | | | | | | | | | |
| Hammers | | | | | | | | | | |
| | | | | | | | | | | |
| **Furnaces** | | | | | | | | | | |
| Heat-treating | | | | | | | | | | |
| Forging | | | | | | | | | | |
| | | | | | | | | | | |
| **Pyrometers** | | | | | | | | | | |
| **Lead pots** | | | | | | | | | | |
| **Tempering baths** | | | | | | | | | | |
| **Finishing** | | | | | | | | | | |
| Plating tanks | | | | | | | | | | |
| Cleaning tanks | | | | | | | | | | |
| Automatic plating machines | | | | | | | | | | |
| Spray guns | | | | | | | | | | |
| Drying ovens | | | | | | | | | | |
| | | | | | | | | | | |
| **Tools: attachments** | | | | | | | | | | |
| Chucks | | | | | | | | | | |
| Faceplates and jaws | | | | | | | | | | |
| Machine vises | | | | | | | | | | |
| Die sets | | | | | | | | | | |
| Toolholders | | | | | | | | | | |
| Collets | | | | | | | | | | |
| Counterbores | | | | | | | | | | |
| Drills | | | | | | | | | | |
| Hobs | | | | | | | | | | |
| Milling cutters | | | | | | | | | | |
| Reamers | | | | | | | | | | |
| Threading tools | | | | | | | | | | |
| | | | | | | | | | | |

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# EDITORIALS

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McGRAW-HILL PUBLISHING COMPANY, INC.
K. H. CONDIT F. H. COLVIN
EDITORS

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## Chips

Washington continues as the center of interest and the principal generator of business alibis as lame duck Congress convenes . . . Problems demanding immediate attention include war debts, administrative economy, revenue legislation, a beer bill, repeal of the 18th Amendment . . . President talks about huge cut in expenses . . . Early vote on prohibition likely . . . Manufacturers' sales tax getting more serious consideration . . . Flood of notes from European debtors reminds one of war days . . . Congress more likely to think of recent economic aggression on part of some of the debtors than of probable economic advantage to all of eliminating whole debt problem.

At stormy session A. F. of L. demands 30-hour week, unemployment insurance financed by industry . . . threatens force if demands are refused . . . prepares to fight spread of racketeering in labor union control . . . U. S. Employment Service reports improvement of employment in October . . . Keller, Chrysler general manager, announces intention to recall 6,000 more old employees by Dec. 15 . . . force has been stepped up from 15,000 to 22,000 recently . . . National Council of Compensation Insurances announces that occupational disease hazards will become part of compensation rating structure in workmen's compensation . . . effective Dec. 31 in certain states, in others later.

League of Nations Council discharges Lytton Commission on Far Eastern troubles and passes report to League Assembly without recommendation . . . debate starts in Assembly . . . Debts situation threatens success of disarmament conference . . . Persia cancels British oil concession . . . Russian diplomacy suspected . . . Japan alarmed by gold outflow, continued fall of yen . . . Cabinet impasse in Germany forces President Hindenburg to invite Von Schleicher to form one . . . England plans a new plant to manufacture Bessemer steel.

New Jersey opens 3½-mile, $21,000,000 highway link across Hackensack meadows . . . will cut time of commercial traffic across state and bring Newark Airport nearer New York . . . Pan-American Airways contracts for six trans-oceanic flying boats . . . Air Express Corporation inaugurates transcontinental express service on Dec. 12 . . . planes carry express only and allow 17 hours New York to Los Angeles . . . rates $1.75 for first pound, $1 for each additional pound . . . Cord captures Transamerican Airlines, improves his representation on Aviation Corporation Board . . . Pierce-Arrow truck unit moves to Cleveland as step in White-Studebaker coordination . . . More locomotives in need of repair, also freight cars . . . H. G. Taylor named commissioner of Western railroads . . . Henry Ford undergoes rare major operation . . . recuperates rapidly . . . Coolidge's National Transportation Committee will get brief from railroad executives Dec. 8 . . . General Electric plastics department on 24-hour basis.

Steel production declines slightly . . . farm prices off 2 per cent . . . General Electric forms finance corporation for installment sales . . . Bradstreet, Dun and Labor Bureau food and commodity indexes lost some ground in November . . . Cotton exports (in bales) compare favorably with exports of 1928 and 1929 . . . Carloadings dip and recover somewhat . . . Electric power output declines seasonally . . . Steel prices soften a trifle . . . Non-ferrous metals experience dullest week of year.

## • INDUSTRIAL REVIEW •

**November machinery business failed to measure up to expectations. In those centers where the first ten days of the month looked promising the slump of the remaining portion pulled the total down to levels approximating the lows of the summer. Not much is expected from December. The work of the National Committee for Industrial Rehabilitation has not as yet led to appreciable machine tool business.**

**In Detroit supply business is better and one company, Ex-Cell-O Tool & Aircraft, bought a planer and vertical and horizontal boring machines. Inquiries are better and January prospects look brighter than for many months. Chicago finds some interest in special equipment but practically none in standard machines. Indianapolis reports that things are practically at a standstill in Indiana and Kentucky.**

**Cincinnati has been unable to trace any machine tool business to the activities of the Robertson Committee but is behind the campaign. In St. Louis business is at the low point of the year. Milwaukee tells of instances of sharp buying practice that are discouraging.**

**Cleveland reports a little business but feels that it may be some time before the rehabilitation campaign develops any appreciable machine tool business. Pittsburgh has much the same opinion, although one dealer reports two orders traceable to that source.**

**New York says that the last half of November failed dismally to keep up with the first half and that there was a considerable drop from October. Boston has heard nothing very exciting but expects results from rehabilitation activities later. In Philadelphia nothing has been done along this line, much to the disappointment of machinery men.**

# Varied Program Pleases Members at A.S.M.E. Annual Meeting

With a surprisingly good attendance and a program more diversified than any heretofore presented, the annual meeting of the American Society of Mechanical Engineers got off to a good start 9 a.m. December 5 at the society's New York headquarters. The papers offered covered a wide field including pure theory, shop practice, economics and industrial education. A summary of those directly applicable to the metal-working field has already been given in these columns (*AM*—Vol. 76, page 1132c).

The spice of variety extends to the meeting excursions which have long been an attractive part of the A.S.M.E. programs. Two liners, a seatrain terminal, three power plants, an industrial plant and a publishing company will be visited.

The *S.S. Europa,* a modern North German Lloyd liner equipped with Framin anti-rolling tanks, on December 6, and the *S.S. Conte di Savoia,* of the

A. A. POTTER
**President-elect, A.S.M.E.**

Italian line, at the completion of her maiden voyage on December 8, are the two ships open to the visitors. A trip to the Seatrain Lines terminal at 14th St. Hoboken on December 8 will afford an opportunity to inspect one of the latest developments in transportation. Loaded freight cars are shipped between New York and Havana, and New Orleans and Havana, on Seatrain vessels, each vessel having a capacity of 100 cars. An 125-ton crane at the terminal unloads and loads a vessel in ten hours.

The power plants to be visited are those of the United Electric Light and Power Co., at Hell Gate, on December 5, the Brooklyn Edison Co., at Hudson Ave., on December 7 and the New York Edison Co. on the East River on December 8. On December 7, a visit to the works of Colgate-Palmolive-Peet at Jersey City has been planned. This company employs over 2,000 workers and manufactures cosmetics, toilet articles and glycerin.

On the morning of December 6, a visit to the new 33-story building of the McGraw-Hill Publishing Co. will be in the itinerary. The processes necessary for the complete production of magazines, catalogs and books from editor to shipping department are contained in this building. Twenty-seven of the 32 McGraw-Hill magazines are printed here.

# Industrial Leadership Discussed by Taylor Society

Led by H. S. PERSON, managing director, the Taylor Society will discuss "The Call for Industrial Leadership" at the first session of its three-day meeting held in New York beginning December 7. Among those to join in the discussion are WALTER V. BINGHAM, director, Industrial Research Federation; JOHN M. CARMODY, editor, *Factory and Industrial Management;* and IDA M. TARBELL.

Other topics to be presented during the later sessions are: "Current Problems of Industrial Management," by JAMES D. MOONEY, president, General Motors Export Corporation; "How Can the Industrial Engineer Help Management?" by HAROLD V. COES, Ford, Bacon & Davis; "Why the Smaller Plant Leads Today," by D. R. STEVENS, vice-president, the Okonite Company; "Think in Terms of Product—Not Process," by E. D. MARTIN, vice-president and general manager, Emark Battery Corporation; "The Influence of Scientific Management in American Industry," by SANFORD E. THOMPSON, president of the Taylor Society, and president of The Thompson & Lichtner Co.; "Observations on Management in the Soviet Union," by MARY VAN KLEECK, director, Department

## Exports of Machinery During October, 1932

| | October, 1932 | Sept., 1932 | October, 1931 |
|---|---|---|---|
| Electrical machinery | $3,889,807 | $3,032,824 | $7,780,420 |
| Power-generating machinery (except electric and automotive) | 296,712 | 249,766 | 739,891 |
| Construction machinery | 259,874 | 180,581 | 512,775 |
| Mining, well and pumping equipment | 741,580 | 780,257 | 1,319,102 |
| Power-driven, metal-working machinery | 1,382,429 | 1,074,471 | 1,566,622 |
| Other metal-working machinery | 98,943 | 87,714 | 252,706 |
| Textile machinery | 297,733 | 257,389 | 671,573 |

## Exports of Metal-Working Machinery During October, 1932

| | October, 1932 | Sept., 1932 | October, 1931 |
|---|---|---|---|
| Engine lathes | $40,964 | $82,273 | $12,763 |
| Turret lathes | 6,149 | 3,597 | 8,868 |
| Other lathes | 57,952 | 44,651 | 54,077 |
| Vertical boring mills and chucking machines | 9,740 | 11,223 | 20,362 |
| Thread cutting, automatic screw machines | 49,991 | 22,495 | 31,569 |
| Knee and column type milling machines | 58,392 | 29,413 | 19,669 |
| Other milling machines | 138,381 | 55,861 | 28,596 |
| Gear cutting machines | 148,074 | 103,309 | 23,687 |
| Vertical drilling machines | 2,032 | 2,777 | 16,470 |
| Radial drilling machines | 48,239 | ..... | 11,924 |
| Other drilling machines | 124,790 | 39,281 | 57,819 |
| Planers and shapers | 24,405 | 2,086 | 22,532 |
| Surface grinding machines | 8,410 | 23,634 | 19,689 |
| External cylindrical grinding machines | 78,169 | 26,439 | 163,035 |
| Internal grinding machines | 24,921 | 88,108 | 8,546 |
| Tool grinding, cutter grinding and universal grinding | 24,132 | 16,247 | 23,791 |
| Other metal grinding machines | 68,376 | 81,168 | 75,046 |
| Sheet and plate metal working machines | 153,638 | 194,322 | 531,747 |
| Forging machinery | 35,565 | 27,634 | 106,981 |
| Rolling mill machinery | 48,681 | 19,633 | 30,972 |
| Foundry and molding equipment | 23,966 | 28,481 | 49,435 |
| Other power-driven metal-working machinery and parts | 207,462 | 171,839 | 248,684 |

### Related Exports

| | | | |
|---|---|---|---|
| Pneumatic portable tools | 25,646 | 29,639 | 44,685 |
| Other portable hand-operated machines | 21,356 | 32,388 | 38,530 |
| Chucks for machines | 3,939 | 2,635 | 7,744 |
| Machine-operated pipe and thread cutters, stocks, dies, taps and other machine-operated cutting tools | 26,266 | 15,047 | 107,908 |
| Other metal-working machine tools | 21,736 | 8,005 | 53,827 |

of Industrial Studies, Russell Sage Foundation; "An Introductory General Analysis of Marketing Costs," by L. H. D. WELD, director of research, McCann-Erickson Inc.; "A Method of Allocating Marketing Costs to Individual Commodities," by FRANK M. SURFACE, assistant director, Department of Foreign and Domestic Commerce; "Analyses of Sales Costs," by ELTON WITTMER, sales analyst; "Marketing Costs As a Factor in Economic Recovery," by FREDERICK M. FEIKER, director, Bureau of Foreign and Domestic Commerce; "The Responsibility of the Individual for His Economic Security," by E. HAYDEN HULL, consultant in personnel problems; "A Plan for Financial Security of Employees," by RALPH S. WESTING, Young & Ottley, Inc.; and "Symposium Discussion of the Problem of Purchasing Power" in which will join GORDON C. CORBALEY, president, The American Institute of Food Distribution, ROBERT R. DOANE, statistician, HENRY PRATT FAIRCHILD, professor of sociology, New York University, and J. E. WEBSTER, general works engineer, Westinghouse Electric & Mfg. Company.

Election of officers will be announced on December 8. The following slate was presented to the members by letter ballot:

President—SANFORD E. THOMPSON, Vice-President—WALTER D. FULLER, secretary and vice-president, Curtis Publishing Company, Treasurer—EDWARD W. CLARK, 3RD, E. W. Clark & Company, Directors—FESSENDEN S. BLANCHARD, merchandising manager, Pacific Mills; WILLARD E. HOTCHKISS, New York University; H. S. PERSON.

## Chapman Again Heads Standards Council

At the annual meeting of the American Standards Association, held in New York, November 30, Cloyd M. Chapman was elected chairman of the Standards Council for the third time. In his report Mr. Chapman listed important new projects initiated or completed during the year.

Bancroft Gherardi, retiring president of the association and vice-president of the American Telephone & Telegraph Co., declared in his address that, despite the depression and drastically reduced funds, 2,700 scientists, engineers, industrialists, and government experts representing 570 technical, trade and governmental bodies have been at work during 1932 on basic industrial standards. During the year, 43 new material standards have been approved by the association, and 32 new national standardization projects have been initiated.

# 60 Per Cent Drop in Small Tools

According to the preliminary figures of the Bureau of Census the value of machine-tool accessories and machinists' precision tools and instruments made during 1931 was 60.1 per cent under the figure for 1929. For 1931 the value was $73,153,127 as against $183,138,948 for 1929. These figures include small tools made as secondary products in other industries.

The largest single item covers tools under the heading subpresses, punches, dies, etc., for punch, stamping and forming presses which were manufactured to

### Summary for the Industry:

| | 1931 | 1929 | Per Cent of Decrease |
|---|---|---|---|
| Number of establishments | 718 | 722 | —0.6 |
| Wage earners (average for the year) | 17,533 | 26,682 | —34.3 |
| Wages | $26,558,780 | $51,084,540 | —48.0 |
| Cost of materials, fuel, and purchased electric energy | $16,319,780 | $26,992,631 | —39.5 |
| Products, total value | $69,033,154 | $144,410,890 | —52.2 |
| Machine-tool accessories and precision tools and instruments | $59,991,443 | $134,273,247 | —55.3 |
| Other products, value and receipts for contract and repair work | $9,041,711 | $10,137,643 | —10.8 |
| Value added by manufacture | $52,713,374 | $117,418,259 | —55.1 |

### Machine-Tool Accessories and Machinists' Precision Tools and Instruments—Production, by Class and Value: 1931 and 1929

| | 1931 | 1929 |
|---|---|---|
| Machine-tool accessories and machinists' precision tools and instruments made in all industries, aggregate value | $73,153,127 | [1]$183,138,948 |
| Made in the "Machine-tool accessories and machinists' precision tools and instruments" industry | 59,991,443 | [1]134,273,247 |
| Made as secondary products in other industries | 13,161,684 | 48,865,701 |
| Attachments and fixtures, total value | $46,455,936 | $98,143,962 |
| General equipment: | | |
| Chucks — | | |
| Drill | 338,044 | 1,311,792 |
| Lathe | 574,716 | 2,725,483 |
| Magnetic | 84,908 | 360,495 |
| Vises (machine) | 93,392 | 182,232 |
| Attachments for machine tools: | | |
| Boring-machine | 215,628 | (2) |
| Drilling-machine | 374,882 | (2) |
| Lathe (engine) | 200,168 | (2) |
| Other machine-tool | 814,643 | (2) |
| Special equipment: | | |
| Jigs and fixtures | 4,276,792 | 20,014,120 |
| Subpresses, punches, dies, etc., for punch, stamping, and forming presses, etc | 27,363,966 | 46,510,752 |
| Die-casting and drop-forging dies | 431,113 | 1,270,754 |
| Tools for screw and automatic machines (box tools, hollow mills, work and tool holders, etc.) | 1,233,659 | 4,056,307 |
| Specially designed tools | 2,742,557 | 5,657,978 |
| Special machinery (other than machine tools), model and experimental work | 2,281,673 | 5,066,984 |
| Other attachments and fixtures | 2,044,733 | 6,357,683 |
| Attachments and fixtures not reported separately | 3,385,062 | 4,629,382 |
| Small tools and machinists' precision tools and instruments, total value | 26,697,191 | [1]84,994,986 |
| Arbors and collars | 99,449 | 364,716 |
| Collets (lathe, milling-machine, and drill) | 72,004 | 345,523 |
| Counterbores | 323,358 | 1,116,719 |
| Countersinks and combination countersinks and drills | 184,514 | [3]65,222 |
| Drills: | | |
| Carbon | 1,845,137 | 4,096,029 |
| High-speed | 3,052,284 | 9,911,434 |
| Hobbing cutters (principally high-speed) | 1,106,139 | 2,078,916 |
| Lathe, planer and shaper tools (not including tool holders), principally high-speed | 540,261 | 1,140,643 |
| Milling cutters (all types), end mills, slotting cutters, etc.: | | |
| Solid — | | |
| Carbon | $182,517 | $10,704,526 |
| High-speed | 3,143,005 | |
| Inserted-teeth | 804,833 | |
| Reamers (solid, expansion and inserted-blade): | | |
| Carbon | 808,359 | 3,114,356 |
| High-speed | 1,334,437 | 5,042,556 |
| Threading tools: | | |
| Taps and dies, not pipe-threading — | | |
| Taps — | | |
| Carbon | 1,157,283 | 3,526,272 |
| High-speed | 1,225,271 | 3,069,694 |
| Dies — | | |
| Carbon | 670,232 | 1,337,119 |
| High-speed | 185,778 | 1,362,676 |
| Chasers | 1,345,633 | 3,251,469 |
| Pipe-threading — | | |
| Taps | 261,046 | 300,435 |
| Dies | 532,425 | 1,346,867 |
| Pipe stocks complete with dies | 1,083,890 | 2,338,528 |
| All other cutting tools, tool holders, mandrels, etc | 2,659,996 | |
| Precision measuring tools (micrometer and vernier) and gauges (plug, ring, snap, thread, etc.) | 2,069,012 | 30,481,286 |
| Other measuring tools | 1,209,764 | |
| Small tools not reported separately | 800,564 | |

[1]Revised.
[2]Reported under "Other attachments and fixtures" for 1929.
[3]Countersinks only; not comparable with item for 1931.

the value of $27,363,966. The census figures for machine tools already reported (*AM*—Vol. 76, page 972d) showed a decrease of 70 per cent.

## Engineering Week at Chicago Fair

June 25-30 at the Century of Progress Exposition of the Chicago World's Fair has been designated as "Engineering Week." One day of this week will be known as "Engineers' Day."

It is anticipated that a great gathering of engineers from all parts of the country and from many European countries will meet at that time. The plan is for various societies to hold individual or joint meetings of their own groups except on Engineers' Day, when all will join in one conference. The outstanding engineers of this and other countries will appear on the program to report the newest developments in their respective fields.

During this program there will be an exposition of power and engineering machinery and appliances.

Under the chairmanship of Harry B. Gear, a general committee for the management of this plan has been established in Chicago. A number of subcommittees have already been appointed and organization work is under way.

Nineteen engineering societies have already indicated their willingness to participate in this gathering either through their national headquarters or through their Chicago chapters. These are as follows:

American Association of Engineers
American Ceramics Society
American Foundrymen's Association
American Institute of Electrical Engineers
American Institute of Mining and Metallurgical Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
American Society of Municipal Engineers
American Society for Testing Materials
American Society of Agricultural Engineers
National Council of State Boards of Engineering Examiners
Society for the Promotion of Engineering Education
Society of Industrial Engineers
Institute of Radio Engineers
Western Society of Engineers
American Institute of Architects
American Society of Heating & Ventilating Engineers
American Society of Refrigerating Engineers
National Association of Practical Refrigerating Engineers

## Automotive Exports Improve

October saw a reversal of trend in the exports of automotive products which have decreased every month since May. This improvement is caused by a greater demand for heavy-capacity trucks and miscellaneous automotive products according to the Bureau of Foreign and Domestic Commerce.

The October total of $5,355,793 represented an increase of $97,524 or 1.8 per cent over the September figure, the first time since 1928 that automotive exports have risen during this month.

Although passenger car shipments declined by $583,792, those of trucks rose by $78,953 and miscellaneous products by $602,363. Belgium retained its position as the leading market for trucks while the Union of South Africa was the chief destination for passenger cars. Many of the Belgium shipments are intended for re-export.

## Job Insurance Opposed

Action taken during the past week for the adoption of compulsory unemployment insurance in five states — New York, Connecticut, Massachusetts, New Jersey and Pennsylvania—was strongly opposed by employer groups. At a hearing before the legislative committee on unemployment in the Bar Association Building, New York, testimony was taken particularly in reference to a bill considered by this committee.

Merwin K. Hart, president of the State Economic Council; Marc A. Daly, secretary of Associated Industries, Inc., and George T. Earle, representing the New York and New Jersey branches of the Metal Trades Association, vigorously opposed the insurance proposal on the ground that it would prove an intolerable burden to industry.

Mr. Hart warned that such legislation in New York would drive many plants from the State and that industry needed less not more burdens. Mr. Daly contended that measures to ameliorate unemployment were still in a chaotic stage and that the experience of individual concerns with voluntary insurance should be awaited. He argued that additional social legislation would be too heavy and might prove to be "the last straw that will break the camel's back."

Taking an opposite viewpoint, Miss Frances Perkins, State Industrial Commissioner, assailed the proposed draft as niggardly. She disclosed an alternate plan in preparation to be drawn up by the Interstate Commission on Unemployment Insurance, which may be introduced in New York, Connecticut and Massachusetts and perhaps in New Jersey and Pennsylvania.

Roderic Alzendam, research director of the Metropolitan Life Insurance Co., testified that it was doubtful whether compulsory unemployment insurance was feasible. He outlined a plan of voluntary reserves by industry.

Governor-elect Lehman while sympathetic to the aims of this kind of insurance is said to be opposed to increasing the taxation upon industry until it is definitely established that the country is emerging from the depression.

## Jig Bushing Tentative Standard

Technical Committee No. 8 on the standardization of small tools and machine tool elements, under the chairmanship of C. E. Rundorff, has offered a tentative standard for comment and criticism. The proposal covers dimensions and tolerances for press fit wearing bushings, renewable wearing bushings and liner bushings.

The press fit and renewable bushings are designed to be bored for drill sizes up to and including 1¾ in.; ten different outside diameters of the former and seven of the latter are included. Each diameter covers a specific range of drill sizes. Seven sizes of liner bushings are provided; the inside diameters of these are fixed by the outside diameters of renewable wearing bushings with which they are to be used.

## •BUSINESS ITEMS•

Ex-Cell-O Aircraft & Tool Corp., Detroit, has appointed Central Tool Sales Co., 602 W. Randolph St., Chicago, its representative in the Chicago territory for all its products except the precision boring machine. The latter company was formerly known as the Paddock-Craven Co. Sales of precision boring machines and Krueger-Wayne tool division products in Illinois, northern Indiana, and southwestern Michigan will be handled by the Dean Machinery Co., 80 E. Jackson Blvd., Chicago.

The Whitcomb Locomotive Co., Rochelle, Ill., a subsidiary of the Baldwin Locomotive Works, has taken over the Milwaukee Locomotive Mfg. Co., formerly owned by Westinghouse Air Brake Co., and the Westinghouse company becomes a stockholder in the Whitcomb company. The Milwaukee company makes internal-combustion engine locomotives and its operations have been conducted at the plant of the National Brake & Electric Co., a Westinghouse Air Brake subsidiary.

Paul R. Jordan & Co., Indianapolis, have filed articles of incorporation to manufacture all kinds of machinery. The directors are: PAUL R. JORDAN, A. F. GLAZIER, and CHARLES E. WOOLEN.

The Dean Machinery Co., 80 E. Jackson Blvd., Chicago, Ill., has been given exclusive selling rights in the Chicago territory for the complete line manufactured by the Consolidated Machine Tool Corp., Rochester, N. Y. The line includes the Betts, Newton, Colburn and Hilles & Jones trade names.

The Morse Twist Drill & Machine Co., New Bedford, Mass., is now carrying a complete stock of high-speed and carbon drills, reamers, taps, dies, and milling cutters at 570 W. Randolph St., Chicago, Ill. This stock will supplement distributors' stocks in Chicago and the Middlewest.

Moore-Handley Hardware Co., 25 S. 20th St., Birmingham, Ala., has been appointed distributor and direct representative for the entire line made by the Link-Belt Co., Chicago. The distributor will carry suitable stocks.

The Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, has appointed CHARLES W. STONE, 201 Sexton Bldg., Minneapolis, an exclusive agent in the Twin Cities territory to represent the lines of machinery distributed nationally by the Bryant organization.

The Research & Mfg. Corp., 900 Victory Bldg., Philadelphia, Pa., has been organized to serve manufacturers lacking research departments and also to help inventors. If the invention indicates a promise of cuccess, it will be accepted and the company will proceed immediately with engineering, experimenting and design efforts to reduce the ideas into practical marketable products.

The Parr Instrument Co., 222 52nd St., Moline, Ill., has been organized by H. L. PARR, and has acquired the scientific instrument business of the Burgess-Parr Co. The organization will manufacture instruments for chemical laboratories. The Burgess-Parr Co. will continue to manufacture Illium castings for the chemical process industries.

The Sun Typewriter Co., New York, and Newark, N. J., has leased floor space in the plant formerly occupied by the Candee Rubber Co., New Haven, Conn. Machinery will be moved to New Haven and operations started early in December. The company discontinued manufacturing typewriters several years ago but now manufactures electric signs, metal specialties and automatic packing machines.

The building occupied by the J. A. Webb Leather Belting Co., and the J. L. Osgood Machinery & Tool Co., Inc., 45 Pearl St., Buffalo, was destroyed by fire on Nov. 17. Loss was $150,000. Some damage was done to the adjoining plant of the James J. Bresnahan Co., Inc., manufacturers of plumbing fixtures and heating equipment.

The Great States Corp., Richmond, Ind., is moving its lawn-mower manufacturing department to the former Indiana Furniture Company's building at Shelbyville, Ind. About 100 men will be used in the branch plant.

## • PERSONALS •

WALTER F. PERKINS, who has been manager of the Harrison, N. J., works of the Worthington Pump & Machinery Corp. since 1927, has resigned to become vice-president and general manager for The Bartlett Hayward Co., Baltimore, Md. He assumed his new duties on Dec. 1. Mr. Perkins was succeeded at Harrison by HUGH BENET, formerly manager of the Holyoke (Mass.) works.

C. E. PIPER, production manager at the Pittsfield, Mass., General Electric plant since 1928, has resigned to pursue an interest in the Erie Bronze Co.

ROBERT E. DOHERTY, professor of electrical engineering at Yale University, has been appointed dean of the newly organized School of Engineering at Yale by PRESIDENT JAMES R. ANGELL. Mr. Doherty was at one time an associate of the late DR. CHARLES P. STEINMETZ on problems for the General Electric Co. He organized an advanced course in engineering for the company, and also served on the general education committee. He was appointed professor of electrical engineering at Yale in April, 1931.

J. KAYE WOOD has been elected vice-president and chief engineer of the newly formed General Spring Corp., 11 W. 42nd St., New York, N. Y. Mr. Wood was for seven years chairman of the A.S.M.E. Special Research Committee on Mechanical Springs. Mr. Wood will also resume at the above address his practice as consultant in mechanical and structural engineering, and will give special attention to problems in the design and manufacture of mechanical springs and to the solution of mechanical problems by scale models.

GENERAL THOMAS S. HAMMOND, president of the Whiting Corp., Whiting, Ind., has been nominated for the presidency of the Illinois Manufacturers' Association.

CHARLES I. HODGSON, superintendent of the Batavia, N. Y., plants of the Doehler Die Casting Co., will be transferred to Toledo, Ohio, on Jan. 1, where he will have charge of sales development work for the company.

## • OBITUARIES •

SEABURY S. GOULD, vice-president and secretary of Goulds Pumps, Inc., died Nov. 25. He entered the shops of the Goulds company in 1911, and attained his last position in 1924.

DANIEL S. HAVILAND, secretary of the Universal Boring Machine Co., Hudson, Mass., died Nov. 17 after a long illness. Mr. Haviland had been associated with the company since 1918. He was 54.

FRANK E. HINNERS, president, George H. Smith Steel Castings Co., Milwaukee, died Nov. 24. He became associated with the Smith company in 1902.

LOUIS D. JORDAN, 62, gunmaker and organizer of the Maxim Munitions Corp., New Haven, died Nov. 24. Other connections were: head of gun construction at the Marlin Arms Co., and superintendent of the Westinghouse arms plant at New Haven.

JOHN W. BROWN, 72, tank manufacturer at Nappanee, Ind., for many years, died recently. He first started in business as an implement dealer and later began the manufacture of steel tanks.

FRANK H. COLE, superintendent and manager of the Boiler Appliance Co., Watertown, Mass., and formerly a foreman at the General Electric Co., Lynn, died recently. Mr. Cole helped to install the first steam turbine for the Edison company in Boston.

CHARLES ROBB HOUSTON, 82, founder of the Houston, Stanwood & Gamble Co., Covington, Ky., manufacturers of steam engines and boilers, died recently.

ELMER W. STEARNS, formerly manager of the Berlin (Conn.) Iron & Bridge Co., died Nov. 27 at the age of 71.

WILLIAM B. SWAN, president-treasurer of the James Swan Co., Seymour, Conn., manufacturer of small tools, died recently.

## • MEETINGS •

AMERICAN ENGINEERING COUNCIL, Annual meeting. January 15, 1933. Washington Hotel, Washington, D. C. L. W. WALLACE, secretary, 744 Jackson Place, Washington, D. C.

SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting. January 23-26. Book-Cadillac Hotel, Detroit. JOHN A. C. WARNER, secretary, 29 West 39th St., New York.

MALLEABLE IRON RESEARCH INSTITUTE. Annual meeting. December 14. Cleveland. ROBERT E. BELT, secretary, 1820 Union Trust Bldg., Cleveland.

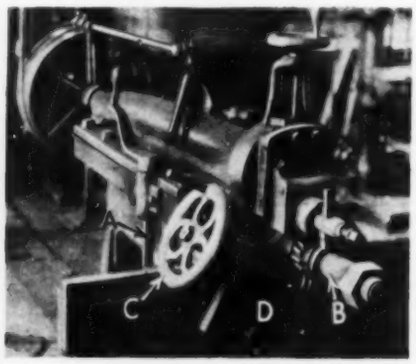
# • IDEAS FROM PRACTICAL MEN

## An Old Shaper

AVERY E. GRANVILLE

This summer, while driving through the South, I ran across a very old shaper in one of the machine shops visited. I was told that the shaper was said to have been made before the Civil War, though I could find neither maker's name nor the date upon it.

The ram is traversed by means of a long, coarse screw about 2 in. in diameter, engaging a nut attached inside of the hollow ram. The drive is by tight and loose pulleys, using crossed and open belts, as commonly used in planer drives. The table feed is power driven by an




attachment that had been added years after the machine was built. The screw for elevating the table can be seen at *A*, but whether or not it was part of the original equipment it is hard to say. The toolpost and the clapper block are about the same as those in use today, and the down feed is practically modern.

What interested me the most about the shaper was a fixture for holding spur gears while cutting the teeth. The gear blank and a gear having the same number of teeth as were to be cut in the blank were placed on the sleeve mandrel *B* and clamped by the usual nut. On the inner end of the sleeve mandrel is attached a small wormwheel in which meshes a worm operated by the handwheel *C*. The whole of the mechanism is mounted on the bracket *D* attached to the cross-rail.

The cut gear on the mandrel was, of course, used as a guide or index only. When the proper gear was not at hand, the teeth were laid off on the blank by dividers, or at times by means of the broken gear that the new one was to replace. By properly grinding the cutting tool, a fairly good job could be made of cutting a wide variety of spur gears.

Another use for the fixture was for shaping circular work, and I was told that on one occasion it has been used for machining the face of a pulley.

## Press Tools for Forming Loops on Flat Springs

ANDREW BEUSCH

The forming and piercing tools illustrated were designed for producing flat springs having looped ends from strips of annealed tool steel, 0.050x½ in., one of the completed springs being shown at *A*. The angular loops were formed and the holes were pierced at one stroke of the press.

In operation, a strip is placed on the die with the end against a stop, as indicated by the heavy dotted lines. On the descent of the ram, the horn *B* on the punch pushes the strip down into the V-block *C*, bending it into a V-shape and throwing up one end at an angle. As the punch is backed by a stiff spring, compression of the spring permits further downward movement of the ram. When the cam *D* contacts with the end of the slide *F*, the slide is pushed to the right and folds the end of the strip over the horn *B*. Near the end of the stroke, the flattening punch *H* contacts with the top of the slide F and squeezes the upper part of the loop between the bottom of the slide and the top of the horn, flattening it completely. Just before the ram reaches the bottom of the stroke, the punches *I* pierce the two holes in the opposite end of the strip.

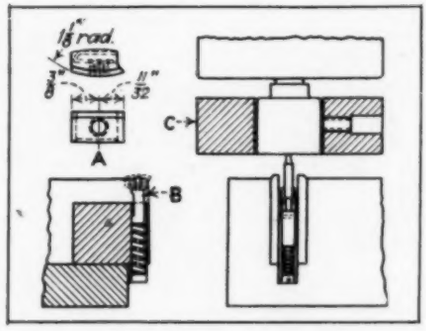
In the view at the right, the tools are shown in the closed position, the spring being formed and pierced. When the ram stops at the end of its upward stroke, the spring is pulled from the horn by hand. The ends at the top of the loops are brazed to the bodies and the springs are then heat-treated.

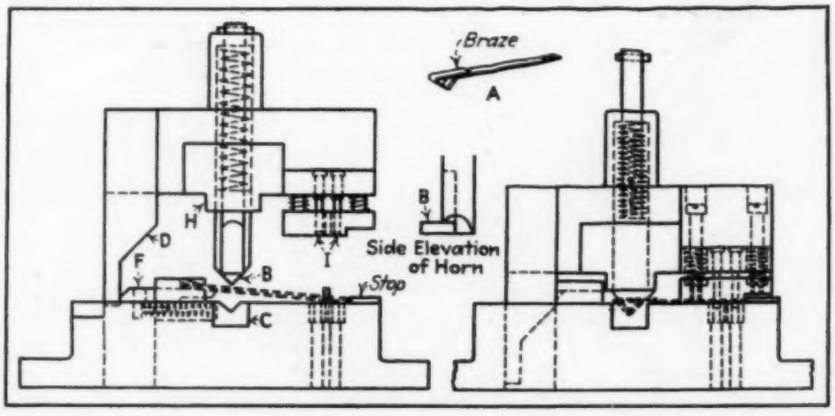
## A Simple Tapping Fixture for an Irregular Piece

EUGENE L. SOLTNER

We had to tap a large quantity of small die-castings of the shape shown at *A* in the illustration. The holes were cored and had to be tapped parallel with the center line from which the 1⅛-in. radius was struck.

The fixture was made from a block of steel drilled and reamed to receive the spring-actuated plunger *B*, the upper end of which was turned down for a pilot to fit the hole in the work. The upward movement of the plunger is limited by a pin engaging a flat on one side. The fixture was held in a machine



vise of the type in which the jaws extended beyond the sides of the body, this offset being necessary to keep the shoulder of the pilot below the top of the jaws.

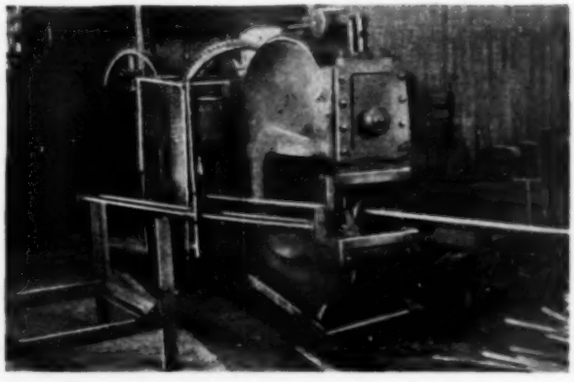
In operation, a piece is put on the pilot and is prevented from turning by being below the top of the jaws. When the tap is lowered it strikes the piece and forces both it and the plunger downward, compressing the spring. When the downward movement of the plunger is arrested by the full compression of the spring, tapping begins.

The tap was held in a conventional tapping head, but the work was too light to cause enough drag to operate the reversing mechanism when the spindle was raised. To overcome this difficulty, the steel collar *C* was attached to the chuck by a headless setscrew and gave sufficient weight to operate the reversing mechanism and to keep the tap in reverse until it is brought into contact with the work and forces the plunger down to the limit, starting the tap in the tapping direction. On backing out the tap, the spring forces the plunger upward, the pilot enters the hole in the work, and as the tap leaves the hole, the work is left on the pilot ready to be removed.

## Angle Die on Gap Punch Cuts Long Bars

W. J. TANGERMAN
*Shop Superintendent,*
*Union Metal Products Co.*

Most of the work in our forge shop is on bar stock, and this naturally necessitates some form of speed shear for the work. We had available a large gap punch, but the depth of gap limited the length of bar it was capable of cutting. However, by setting the dies at the angle illustrated we can shear bars of any length without difficulty. The die has flat blades, the varying diameters of the stock sheared being taken care of by a tapered slot in the stripper, which is a forged "C" bolted to the front of the bottom die. An adjustable gage, composed of two lengths of pipe bolted to the lower die and carrying an adjustable stop, completes the set-up.



## Parking Chain Slings

V. J. HYDAR
*The Falk Corporation*

A box for parking chain slings is shown in the illustration. It is made of heavy lumber and has twelve compartments, each 14x14 in. and 28 in. deep. It has no bottom, thus making it possible to set it on any floor, flat or uneven. A scantling about 3½ in. thick is nailed on one side of the box, near the top, to keep the hook links of the slings away from the side of the box and hanging at right angles to it. Originally, the box did not have this scantling, so that the hook links tended to lie flat against the side.

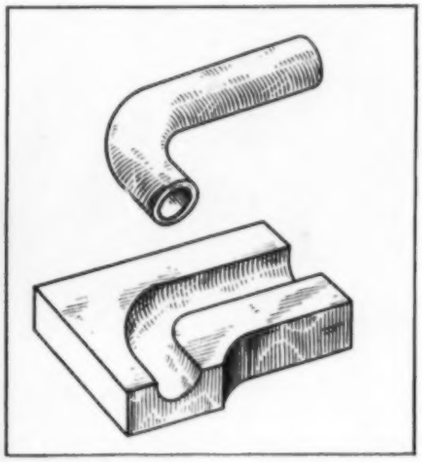
We built this box because we found that chainmen (hitchers) spent a fair share of their time hunting for slings that were left lying here and there on the floor, usually near the machines or the spots where they were last used. Now, the craneman knows where each sling belongs and sees to it that it is kept in its proper place. The box has been useful in other ways. First, in keeping the slings off of the floor it has added to the neatness of the shop and has removed as many stumbling blocks as there are slings, and second, the craneman can pick up or park any sling without waiting for a hitcher to hook or unhook it for him. He simply maneuvers his hook over the desired sling, slips the hook into the hook link and hoists away. Likewise he can unhook a sling without assistance, leaving the hitchers free for other duties.

The box is centrally located in the shop to avoid undue runs of the crane in picking up and parking slings. A chart of safe loads for different sizes of slings was nailed to the box for the information of hitchers.

## Temporary Forming Dies

HERBERT F. CRAWFORD

Where but a few pieces are to be made, it is customary to form them by hand hammering over bars or blocks. The Solar Aircraft Company has found it advisable to make temporary forming punches and dies from soft metal for this purpose. The part is first shaped up in clay and trimmed to the desired size and form. Then a cast is taken with plaster of Paris which acts as a mold for the punch, the thickness of the metal being represented by a thin sheet of asbestos placed in the mold. A plaster cast of the first mold serves as the mold for the die.



The punch to be used is cast in lead and the die in zinc, both being of the commercial metal and without alloy of any kind. Such forming dies produce quite a number of stampings of thin sheet aluminum, duralumin, magnesium or even thin sheet steel. They are intended primarliy for softer metals.

Pieces such as that shown are of course formed in two parts and fastened together by riveting or welding, depending on the metal used.

## Machine for Grinding Ammonia-Tight Joints

CHARLES C. TOMNEY
*Tool Engineer,*
*Brunswick-Kroeschell Company*

In making our ammonia compressors, we do not use gaskets in the joints between the crankcases and the covers, the crankcases and the cylinders, or between the cylinders and the cylinder heads, but make the joints tight by grinding with abrasive and oil. The bottom flanges of the cylinders, the undersides of the cylinder heads and the crankcase covers are corrugated, or grooved, while the mating members of the joints are machined smooth.

The grinding machine is illustrated in Fig. 1 and has a frame of 8x8-in. wooden beams, the ends of the beams being bolted to wooden uprights of the same cross-section. The machine has six stations, each station being operated by a crank driven by miter gears through a shaft driven by belt through tight and loose pulleys. The gears at each station can be thrown in or out of mesh by sliding one of them on the shaft by means of the lever *A*, so that each station can be started and stopped independently of the others. This lever is

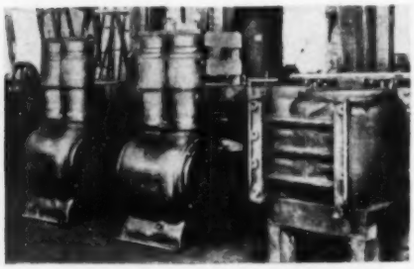


**Fig. 1—Partial view of six-station machine for grinding-in compressor joints**

hinged and when its outer part is dropped between two pins in the lever support, the gears are held in mesh. The operating parts are high enough from the floor for the largest compressors, but the smaller ones are blocked up to the correct height on wooden horses. As the compressors are quite heavy it is not necessary to clamp them.

The cylinder heads are ground to the cylinders and the lower flanges of the cylinders are ground to the tops of the crankcases simultaneously. The cylinder heads are all connected together by a strip of wood, bolts through the wood being screwed into one of the stud-clearance holes in each head, the hole having been tapped for that purpose. Thus the heads are held stationary during the grinding operation. Arms *B* are attached to the sides of the cylinders by brackets and carry ball-ended studs, as

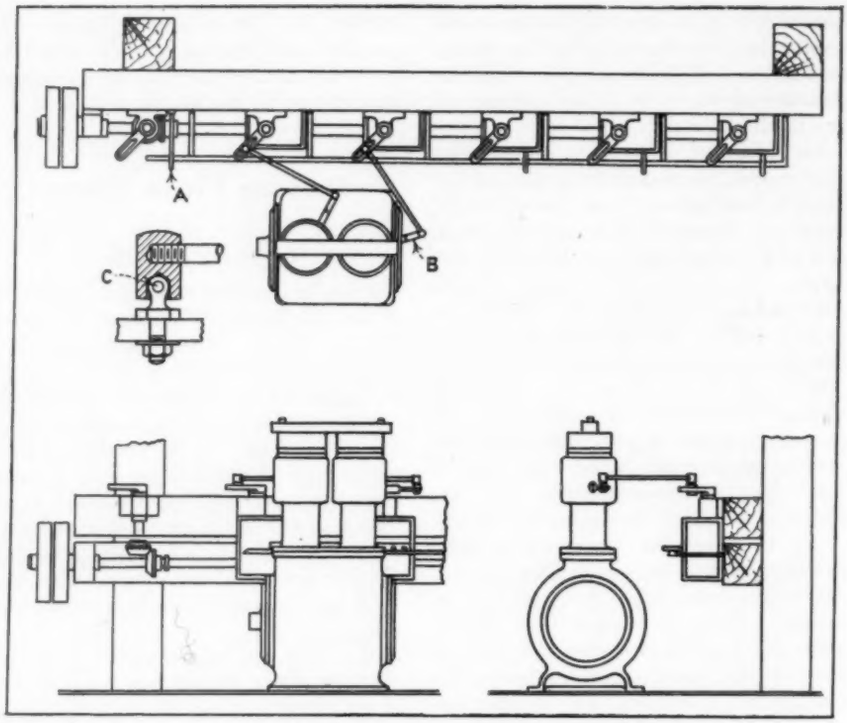



**Fig. 2—Cylinder heads are ground to the cylinders and the lower flanges of the cylinders to the crankcases by rotating the cylinders**

at *C*, Fig. 2, like studs being carried by the cranks. Connection from the cranks to the arms is made by connecting rods having cup-shaped ends to fit over the balls on the studs. The cylinders are rotated back and forth through an arc of about 30 deg., being held centrally by the usual spigots. As a safety measure, the diameter of the connecting rods is but ⅜ in., so that if a cylinder gets stuck the rod will bend instead of pushing the compressor over.

The cylinder joints in six small, single-cylinder compressors can be ground at the same time. In the larger sizes having two cylinders, one cover is ground to its crankcase and four cylinders are ground to their heads and to two crankcases at one setting, as shown in Fig. 2. All cylinder heads and the covers for the small crankcases are weighted to give grinding pressure.

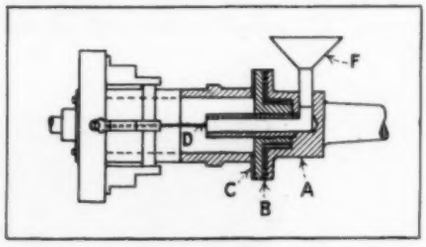
## Centrifugal Lining of Bearings

JAMES J. BAULE

In the illustration is shown a fixture for lining bearing shells by the centrifugal method. It consists of the body *A* having a taper shank to fit the tailstock spindle of a lathe; the bronze thrust bushing *B;* the runner *C;* a piece of pipe *D* screwed into the body; and the funnel *F*. The pipe is slightly smaller than the runner, so that the runner will revolve freely around it.

The shell to be lined is held in the lathe chuck with the inner end tight against the face of the chuck. If the shell is of the split type, liners are placed between the joint faces. After the lining has been cast, the liners are removed to provide clearance for the saw in splitting the lining. If the shells are large, it is well to clamp them together near the outer ends.

In operation, the fixture is brought up tightly against an asbestos washer placed between the shell and the face of the runner. With the lathe in motion, the molten metal for the lining is poured in the funnel. It flows through a hole in the body of the fixture, through the pipe and into the inside of the shell, where it is evenly distributed by cen-




trifugal force. The speed of the lathe and the amount of metal to be poured are determined by practice. We have found this method of lining and relining bearing shells much superior and more expeditious than by casting the lining metal around a mandrel, using dams of fire clay or putty.

# SHOP EQUIPMENT NEWS

## "Cleveland" Model M Six-Spindle Bar and Chucking Machines

To its line of multiple-spindle machines, the Cleveland Automatic Machine Co., Cleveland, Ohio, has added the Model M, six-spindle bar and chucking machines that offer increased tooling possibilities and working range. Bar machines are built in 7/8, 1¼ and 1½ in. sizes; chucking machines, 4¾ and 6½ in. Practically the only difference between the chucking machine and the bar machine is the fact that in place of the air equipment a stock feed is substituted, and standard collets are used for gripping the bar. Slide positions sufficient to take care of six forming or shaving tool operations are provided, and twelve positions are available for end cutting tools to be operated from the main tool turret or the hexagon turret attachment.

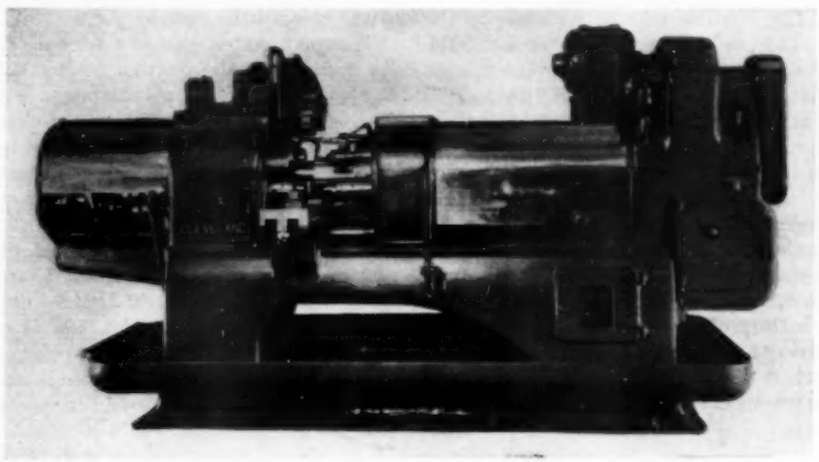
The machine is equipped with two roller slides, one front and one rear, and as standard equipment one double top slide is provided. This top slide is mounted on top of the spindle turret cap, and permits tools to be mounted so as to work on the top and upper rear spindles. Where the nature of the work is such that it requires extra forming or shaving operations, a second double top slide can be mounted at the front and at the opposite angle from the rear top slide, permitting two more forming tools to be added.

Turret housings for spindle and tool turrets are cast integral with the main bed casting. Ample chip space is afforded, and chips may be removed while the machine is operating, either through an opening under the work spindle head or from the rear of the machine. Spindle change gears cover a wide range of speeds and are mounted on the outside of the drive head to permit rapid changing. All gears are made from alloy steel forgings, with helical teeth. The work spindle turret is a one-piece, nickel alloy casting, and spindles are supported in wide bearings. Anti-friction bearings can be furnished. End thrust is taken by ball thrust bearings, seating against the rear spindle sleeve. Force-feed lubrication apportions the correct amount of oil to each bearing.

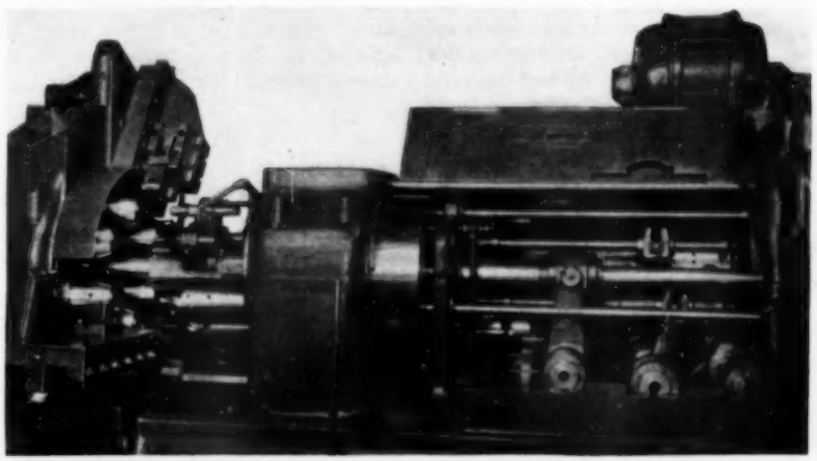
The cylindrical tool turret is arranged for six tool positions and is actuated by cams on the operating drum. Cams act direct on the cam roll inserted in the periphery of the tool turret, and provide direct action against the thrust of the cutting tools. An auxilliary turret, hexagonal in form, is inserted in the center of the main tool turret, and affords six extra independent tool positions for end working tools.

Threading and reaming spindles are accelerated and operate independently of the tool feed, being controlled by individual levers. Additional live spindles can be installed in the tool turret, when necessary to synchronize the cuts better. A positive trip is provided for the threading spindle, controlled by the travel of the threading spindle itself. The two independent cross-slides are mounted at the lower front and rear positions. Feed change gears are of hardened steel with helical teeth. A wide range of tool feeds eliminates necessity for special camming.

Optional chucking includes air, hy-



**Model M Six-Spindle Bar Machine in the 1¼ in. size. The chucking machine may have air, hydraulic or mechanical-type chucks**



**The hexagon turret attachment in front of the main tool turret offers six positions for independently controlled end-cutting tools**

draulic or mechanical types. Customer has choice of full automatic or hand control. A feature of the air control is a single air valve which permits one chuck to be opened and closed for loading while maintaining a constant pressure in the other cylinders.

The hexagon turret attachment, illustrated in Fig. 2, is independent of the main tool turret and actuated by the first lever to the left. In this particular machine there are also provided accelerated spindles independently controlled. In this particular job the machine is equipped with three independent feeds for end-cutting tools. These constitute the two drills in the lower position in the main tool turret, the boring tool and reamer mounted on the hex turret attachment, and trepanning tools at the upper and lower rear positions.

# "Red Ring" Gear Finishing Machine

The National Broach & Machine Co., Shoemaker & St. Jean Sts., Detroit, Mich., states that its "Red Ring" gear finishing machine will correct the profile of gear teeth to within 0.0001+ in. of a true involute curve. At the same time the index eccentricity and helical angle of the gear are corrected, and each tooth surface is made smooth and bright. All this is accomplished without the necessity for changing gears or leadscrews during the operation.

The machine cuts at an angle to the axis of the gear and generates the shape of each tooth in the same direction as that taken by the teeth of two mating gears sliding over one another. The elimination of the "washboard effect" on the gear teeth is an important factor in minimizing gear noise and squeal. Operation of the machine is fully automatic, and it may be set to take off any predetermined amount of stock from the teeth. One operator can serve a battery of machines. A 20-tooth gear having 9.25 pitch, 20 deg. pressure angle and 35 deg. helix angle can be processed in from 20 to 40 seconds, floor-to-floor time.

It is said that the first cost of the tool employed is lower, that it has a longer operating life, and that it is easier to sharpen. The tool is in the form of a gashed helical gear. Axes of the cutting tool and the work gear lie in intersecting planes with a definite angular relation. The point of contact between two mating gears with crossed axes would occur at the point of intersection of their axes projected on the pitch circles of the gears as illustrated at point *F*, Fig. 2. Each of these gears is slotted, the center of the slot coinciding with the point of contact. The center-to-center distance between the two gears is reduced by the amount of relief effected by the slot. Contact between the two gears will be at two points, that is at either side of the slot. These two points become the actual cutting edges in the tool used on the Red Ring machine.

Fig. 3 illustrates the cutting action of this type of tool. The cutting tool and the work gear are developed in section at the pitch line. The slot in the cutting tool provides relieved cutting edges at K and $K^1$ and supporting surfaces at $L^2$ and $L^3$. The shaded sections are those through the work gear teeth. In position $O^1$ there is very little pressure against the teeth and the cutting tool. As the work gear tooth progresses across the tool, it comes into close contact on surfaces $L$ and $L^1$. After passing the cutting point $K$, it is still supported on surfaces $L^2$ and $L^3$. As it passes to the position $O^6$, pressure is again reduced to approximately zero. A desirable condition for proper clearance is effected when the difference between the helix angle of the cutting tool and that of the gear lies between 10 and 15 deg.

The tool will handle between 300 and 500 work units before grinding. Sharpening operation is merely that of face grinding the sides of the slot to a depth of 0.005+ in. Each slot is capable of approximately 10 such grindings. A cutter with five slots would therefore take 50 grindings and could be counted on to finish between 15,000 and 25,000 work units, depending on their characteristics.

The head of the machine is movable about a vertical axis and may be adjusted precisely in order to bring the axis of the cutting tool arbor to the desired angular relation with the work gear arbor on the table beneath. The table has a longitudinal reciprocating movement and a vertical feed. Both movements are automatic. The work

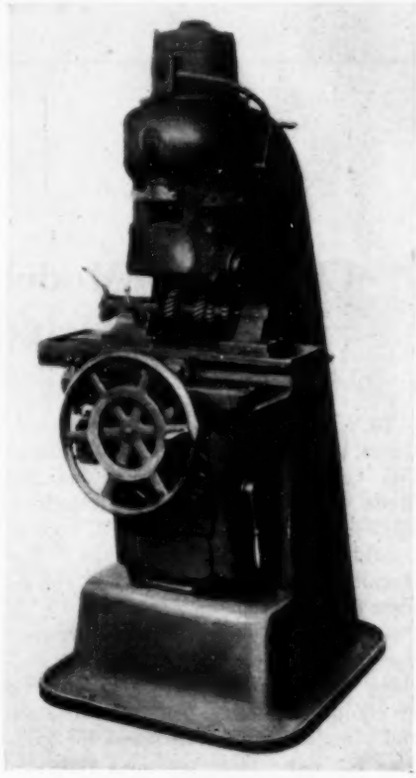


**Fig. 1—"Red Ring" finishing machine set up to process an automobile transmission gear**

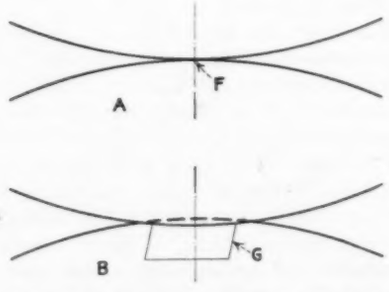



**Fig. 2—Illustrating relief effected by the gash in the cutting gear**

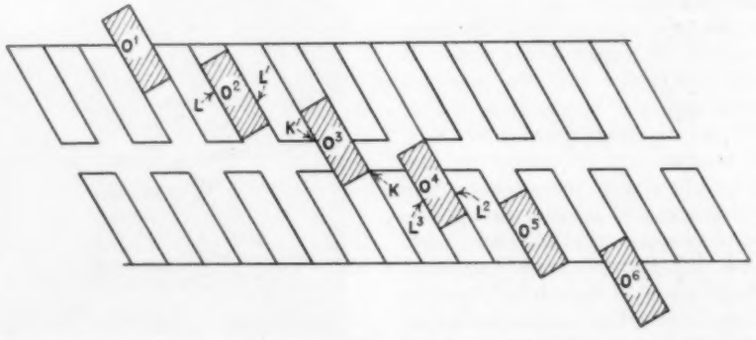



**Fig. 3—Progressive steps in movement of the work gear teeth across the face of the tool**

is held in adjustable centers mounted on the table. A motor in the head drives the cutting tool arbor. A separate motor in the base actuates both motions of the table. Both motors are connected to and controlled electrically by the same reversing switch. Table travel is set at an amount equal to or a little greater than the face of the gear being finished. Simultaneously with the reversal of the table, the direction of rotation of the cutter arbor is likewise reversed. In this way both faces of each tooth on the work gear are subjected to the action of the cutter during every table cycle. Change gears provide the necessary range of table speed and maintain a constant rate of feed.

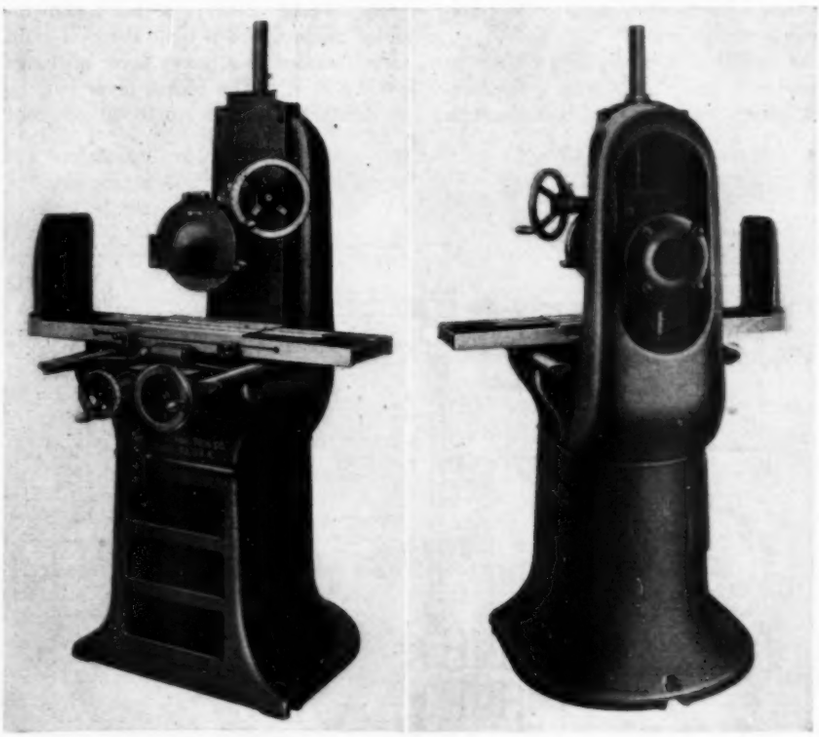
## "Abrasive" No. 1½ Toolroom Surface Grinder

Work ground in the toolroom is constantly increasing in width, and often is beyond the scope of hand-fed toolroom surface grinders. Realizing this trend, the Abrasive Machine Tool Co., East Providence, R. I., is now offering the No. 1½ machine for fine flat and form grinding, and gage grinding. Feed is by hand since it has been discovered that there is seldom need for automatic feed on a machine of this type.

Capacity of the machine is as follows: longitudinal, 15 in.; transverse, 10 in.; vertical, 12 in. Surface of the work table is 15x10 in.; over-all dimensions are 42¾x10 in. Three ⅞-in. T-slots are furnished. Sides of the table are ground square with the spindle and may be used for setting up work. The spindle is hardened, ground and lapped, is 1¼ in. in diameter, and has a taper nose. Normal speed is 1,750 r.p.m. Wheel diameter is 10 in.; thickness, ½ in., and hole size, 3 in. The elevating handwheel is graduated in thousandths and a vernier is provided to obtain quarter thousandths.

Motor drive only is furnished on this machine. The motor is mounted directly on the spindle and is standard shaftless type, precision balanced, both dynamically and electrically. A pushbutton starter is mounted inside the base as standard equipment.

No provision is made for wet grinding or built-in exhaust attachments. The machine may be connected to a central exhaust system, or the company's standard motorized exhaust attachment can be furnished. The wheel-slide weighs 180 lb. with the weight distributed each side of long, narrow guide ways. Use of a ball-thrust bearing and a high lead worm provide rapid and sensitive vertical adjustment. Magnetic chucks can be supplied.



## "Federalite" Alloy Bronze

A modification of iron-bearing aluminum bronze, known as "Federalite," is being produced by the Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit, Mich. It is a metal of high strength and easy flowing characteristics, and was developed for use in propellers where thin blade sections are encountered. In addition to its high ultimate strength, it has a true proportional limit closely approximating the values of many ferrous materials. Physical characteristics are as follows: Tensile strength, 80,000 lb. per sq.in.; proportional limit, 30,000 lb. per sq.in.; elongation, 30 per cent; hardness, 72 Rockwell B; modulus of elasticity, 17,000,000. Resistance to corrosion is high, so that Federalite finds wide usage in castings for marine and under water parts and other highly stressed parts subject to rusting agents.

## Link-Belt Silverlink Roller Chain

"Silverlink" roller chain is made in all sizes from ⅜ to 2½ in. pitch by the Link Belt Co., Indianapolis, Ind. The sidebars of this chain are especially treated to resist corrosion, and this treatment gives them the appearance of silver, consequently the trade name. The chain is available with sprocket wheels for any horsepower, and also with conveying attachment links in wide variety. Complete drives are carried in stock by distributors in sizes up to 225 hp., and in speed ratios of 1 to 1 up to 8 to 1.

Construction features of the Silverlink chain may be summarized as follows: Side bars of alloy rolled steel heat-treated for strength and toughness, and treated to resist corrosion; nickel steel case-hardened pins, detachable type with cotter, or furnished riveted; solid steel casehardened bushings; alloy steel heat-treated rollers, and uniformity and close clearances throughout.

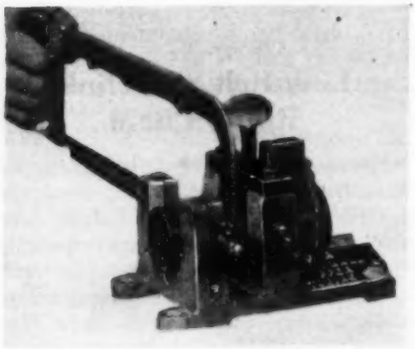
## Manhattan "Compensated" Rubber Belting

The Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J., has developed a "Compensated" belt which is said to develop easily the rated horsepower at one-half the tension and with one-half the amount of slip and creep of a standard rubber belt. The compensated belt has a specially-treated pulley surface with two times the co-efficient of friction ordinarily found. The belt is compensated to run

on small sizes of pulleys. Outside plies are said not to rupture, and the tendency for fasteners to work loose and pull out has been minimized by equalizing the tension of the outside duck ply with that of the inside duck ply. Tests made by the company showed that the belting produced a slip of only 2.75 per cent at 100 per cent overload.

## Beaver Square-End Sawing Vise

For cutting square ends on thin-wall copper or brass tubing, The Borden Co., Warren, Ohio, has introduced the Beaver square-end sawing vise which takes tubing from $\frac{1}{8}$ to 2 in. The vise is made of aluminum with steel inserts to increase strength. Tubing is quickly locked into position by means of the

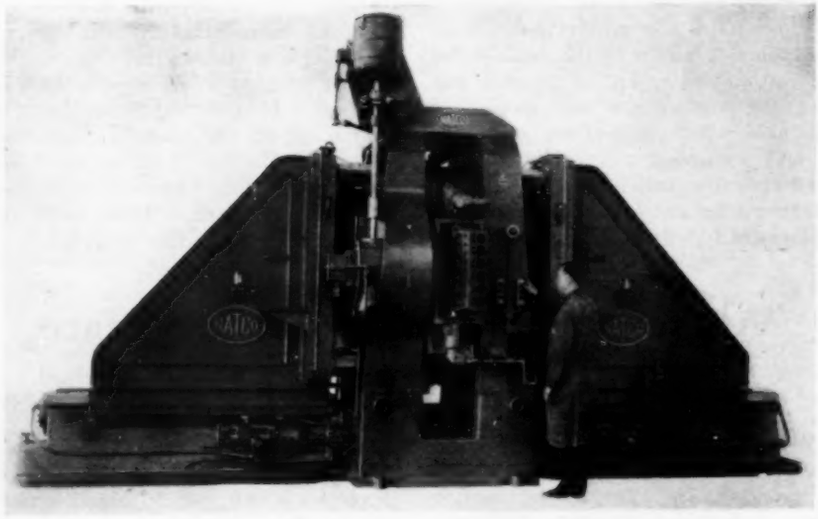


reversible vise block. A thumbscrew prevents over-pressure. A long V-trough insures accurate centering, and the saw guide prevents the saw-blade from running.

## Natco Special Two-Way Machine for Motor Blocks

A special Natco two-way machine has been built for a new six-cylinder block by the National Automatic Tool Co., Richmond, Ind. The machine has four heads for drilling, counterboring, facing, chamfering, countersinking and tapping. The two large units perform all the operations with the exception of tapping and are equipped with hydraulic feed, which is semi-automatic in operation. In addition, both units are equipped with a time delay reverse and positive stop.

Tapping heads are driven by a single reversing motor drive unit, and each spindle is equipped with an individual leadscrew. A five-position, automatic-indexing, trunnion-type fixture was furnished and arranged to hold one block in each position.



The machine is interlocked to prevent indexing the fixture before the heads are in correct position. A total of 18 different operations are performed on the distributor shaft hole on two sides at the rate of approximately 75 blocks per hour. Weight of the machine is approximately 50,000 lb.

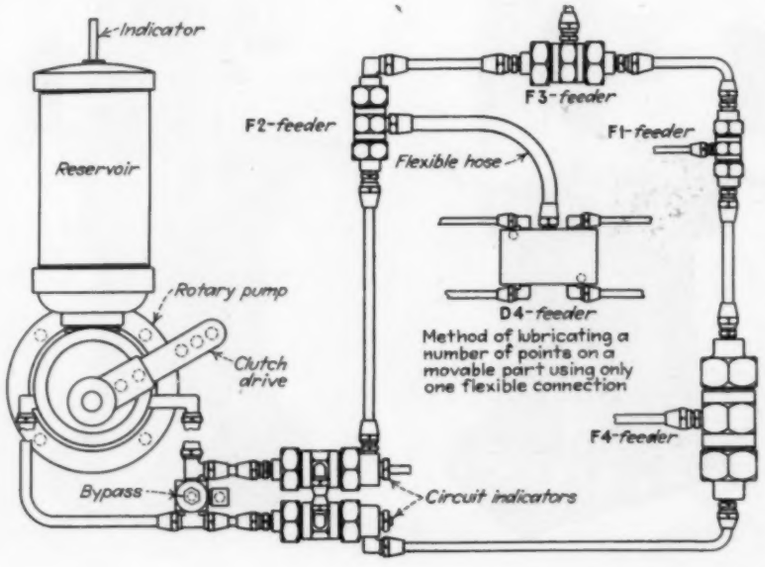
## Improved Trabon Lubricating System

Automatic pressure lubrication of all of the bearings on a machine by means of a one-tube circuit is now possible through recent refinements made by the Lubricating Equipment Co., Detroit, Mich., in its Trabon-type lubricators. One tube with short feeders to the bearings is now required.

The forced-feed is supplied either by a small motor driving a rotary displacement pump, or by a ratchet-connection of the pump to some continuously moving part of the machine. Based on a pump speed of 20 r.p.m., the cycle of complete lubrication can be adjusted at any interval between 5 minutes and 8 hours. Two circuit indicators have been placed in the line, one at the head of the circuit and the other at the end. These indicators may be placed adjacent to the pump or at any other convenient position in the circuit between the pump and feeders. The pump reservoir is made in various sizes to hold up to 12 lb. of lubricant.

## Lukens Improved Nickel-Clad Steel

Nickel-clad steel is a hot-rolled bimetal made up of a light layer of pure nickel bonded to a heavy layer of flange quality steel. The nickel layer can be of variable thickness up to 20 per cent



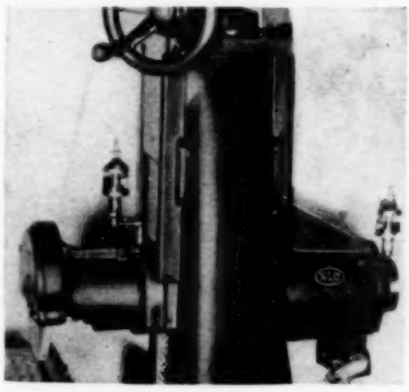
of the total plate thickness and provides corrosion-resistance. This duplex steel is a joint development of The International Nickel Co. and the Lukens Steel Co., and is produced at the latter company's plant at Coatsville, Pa.

Until lately, the nickel-clad steel has been available only in the regular hot-rolled finish, the nickel surface of which carries the tightly adherent nickel oxide film, dark olive brown in color. This type of finish will continue to be produced because of the corrosion-resistant properties of the nickel oxide. A new finish is now available, classified as "hot-rolled and cleaned," being free from nickel oxide. The cleaning process gives the nickel a mat appearance nearly white in color, with surface superior to that produced by standard plate-mill practice. The finish, however, should not be confused with the bright, lustrous surface of cold-rolled and full-finished solid nickel sheet. The nickel-clad steel is now available in rectangular plates and circles in a wider range of sizes than heretofore.

## Ex-Cell-O Motor-Driven Spindles for B&S No. 2 Surface Grinder

Both heavy-duty and standard types of direct-motor driven spindles have been developed by the Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich., for use on Brown & Sharpe No. 2 surface grinders. These motor-driven spindles are produced in addition to another line of standard belt-driven spindles.

The accompanying illustration shows a heavy-duty inbuilt motor-driven spindle with special holding bracket. The spindle and motor are both mounted on a common shaft. The company's precision ball bearings are used in the spindle and motor. The special bracket replaces the bracket furnished with the grinder. At the back of the bracket provision is made for pressing the motor field into place. Sufficient stock is left on the bracket to fit it to the ways of the machine.



A standard type spindle can be fitted into the regular B&S bracket. By boring the bracket out to 3 in., the spindle can be slipped into place. Two holes are drilled and tapped in the bottom of the bracket for setscrews to hold the spindle from turning. The motors used on each type of spindle are the same as those used in the boring units on the company's precision boring machines.

## Tannewitz Abrasive Cut-Off Machine

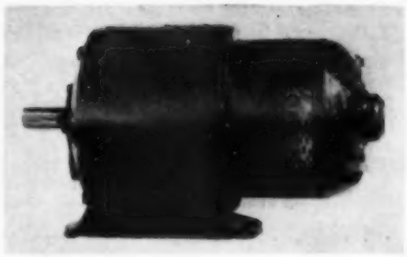
A swivel-table high-speed abrasive cut-off machine for cutting metal moldings, tubing and small bars has been placed on the market by The Tannewitz Works, Grand Rapids, Mich. This machine is made in two sizes, the smaller size taking motors up to 7½ hp.; the larger, motors up to 15 hp.

The spindle runs at 5,500 r.p.m. The circular table, on which the motor and saw yokes are mounted, swivels from

45 deg. left to 45 deg. right. This makes it unnecessary to swing the stock around in order to cut angles. The machine is provided with hold-downs on both sides of the work, treadle-operated. Cutter is depressed by means of a lever. Drive is by multiple V-belts from a ball-bearing motor.

## Allis Motorized Speed Reducers

Motorized speed reducers capable of employing nearly any type of motor have been placed on the market by The Louis Allis Co., Milwaukee, Wis. Motor and speed reducer are combined into a single, compact unit. Ratings available are ¾ to 75 hp. with output speeds from 4 to 400 r.p.m. Efficiencies are claimed to run as high as 97 per cent. Precision gears and pinions with oversized ball bearings are employed throughout. The integral style shown has the endbell removed and the motor close-coupled to the gear casing.



## General Electric Coated Electrode for Manganese Welding

Type W-85 coated electrode for manganese welding has been announced by the General Electric Co., Schenectady, N. Y. This wire finds its principal application in the building up of worn manganese steel castings and in repair of such fractured parts. It can also be applied to obtain a manganese steel surface on parts of ordinary steel and iron. No quenching of the weld-metal is necessary. The coating makes the electrode suitable for both a.c. and d.c. welding.

## Stearns Small Magnetic Clutch

A very small magnetic clutch for machine tools has been developed by the Magnetic Manufacturing Co., Milwaukee, Wis. This "Stearns" clutch is 5 in. in diameter but develops 500 in.-lb. It weighs only 9½ lb. Length is 3¾ in. Current consumption is approximately

100 watts. Collector rings are located on the outside to save space over the usual method of hub mounting. A single disk clutch is employed.

## Bullard High-Speed Vertical Turret Lathe

Complete motorization of its vertical turret lathe for a high-speed model has been undertaken by the Bullard Co., Bridgeport, Conn. In the case of the 42-in. machine, for example, it is possible to obtain table speeds ranging from 4.1 to 150 r.p.m. The higher speed of operation makes the use of the carbide tools particularly desirable.

A vertical turret lathe with flange-mounted motor is illustrated. This view also shows the method of application of the power traverse and rail-raising motors. The main drive motor may be either a constant-horsepower, adjustable-speed, d.c. motor or a constant-horsepower, multi-speed a.c. motor having automatic control. To facilitate operation, the power traverse, rail-raising mechanism, and cutting lubricant system are each individually motorized. A lubricating system provides pressure lubrication to the spindle bearings. The lubricating pump motor is interconnected to the main drive control so that if lubrication fails the machine stops.

All motors are of the ball-bearing inclosed type. The main drive motor may be connected in three different ways. The first method is flange-mounting; the second, direct-coupled with the motor floor-mounted, and the third method by drive through chain or V-belt with motor floor-mounted or bracket-mounted.

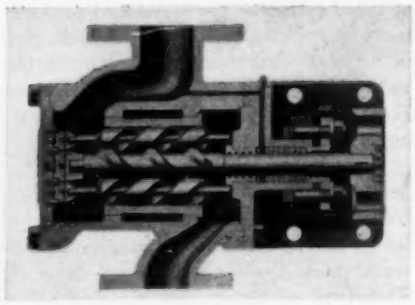
## Trumbull "R.B." Industrial Switches

The Trumbull Electric Mfg. Co., Plainville, Conn., has added to its line of "R.B." industrial switches the following sizes: 30, 400, 600 and 800 amp., including 2, 3 and 4 pole, 230 and 575 volts, a.c., both side and front-operated.

This line has a fuse clamping device which reduces heating at the fuse terminals, and also a new type of roll contact which maintains line contact under heavy pressure to eliminate maintenance troubles. Circular No. 99 describes the line in detail.

## DeLaval "IMO" Rotary Positive-Displacement Pump

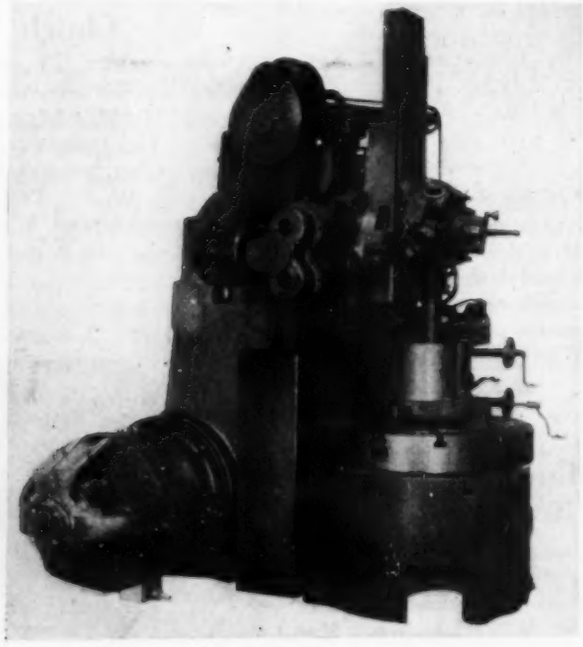
A rotary positive-displacement pump built in capacities from ½ to 700 gal. per minute, and for pressures up to 500 lb. per sq.in., is now available from the DeLaval Steam Turbine Co., Trenton, N. J.

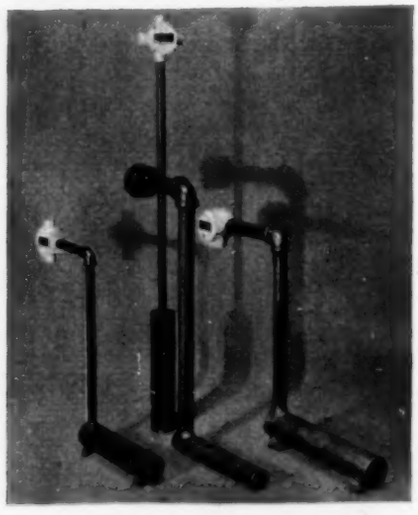


Power is applied to a central or power rotor, which meshes with one or more sealing rotors of such form that they are propelled largely by fluid pressure, with a minimum of mechanical contact. This action results from the shape of the threads, see illustration, those of the power rotor being convex, while those of the idler rotor are concave. This tooth form seals effectively. Efficiencies of 80 to 90 per cent have been obtained. Velocity of liquid through the pump is low and there is no trapping.

## Chromalox Heavy-Duty Electric Immersion Heater

For melting lead, solder, babbitt, tin and type metal; heating salt baths for heat-treating; heating oil baths for heat-treating; and heating pickling baths, the Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh, Pa., has developed heavy-duty Chromalox electric immersion heaters. These heaters are suitable for either 115 or 230 volts. For salt baths and oil baths, the heaters have steel or wrought-iron casing; for melting pots, cast-iron casing. Each type is built in ratings from 1.5 to 5 kw.

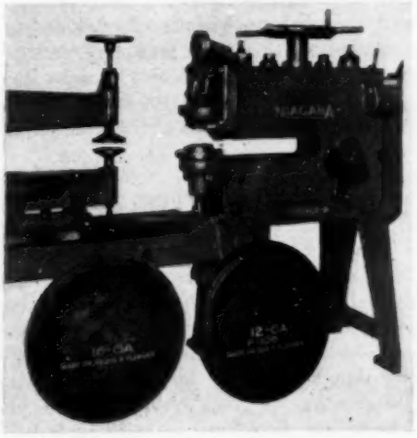




## Special Flanging Rolls for Double-Recessed Container Heads

The Niagara Machine & Tool Works, Buffalo, N. Y., is offering special flanging rolls for the production of the standard type of double recessed heads, flanged for double seaming. These heads are used by drum and tank manufacturers and are employed in the manufacture of double-seamed containers.

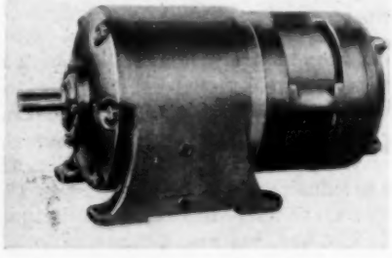
A machine with standard cutters is



used first to cut the flat circular blank. The cutters are then replaced by the flanging attachment with special rolls which completes the head in a second operation. One set of rolls will produce heads over a large diameter range when made by the flanging method, by simply adjusting the position of the circle arm. An extra lower flanging roll obtainable at small cost is required for each variation in depth of chime. The machines will handle metal from No. 26 to No. 12 gage, the last being the heaviest ordinarily double-seamed at the present time.

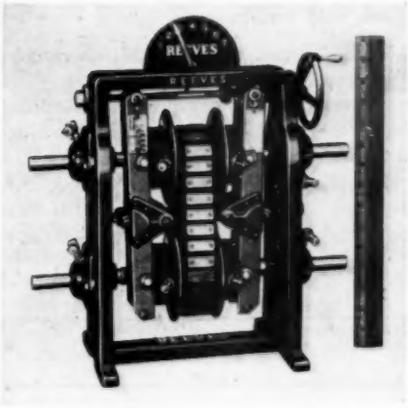
## Allis-Chalmers Motor-Reduction Unit

A standard round-frame motor is mounted directly on the gear reducer housing to form a compact unit. Helical gears are employed. Standard speeds at the power take-off are from 3.02 r.p.m. to 380 r.p.m., but lower speeds can be provided. Bearings supporting the gear drives are ball or roller type. Lubrication is automatic and continuous. Standard units are arranged for floor mounting, but the units can be supplied for wall, ceiling or vertical mounting. Motor types that can be supplied are standard squirrel-cage induction, wound-rotor, inclosed fan-cooled, explosion proof, or direct current. The motor-reduction unit is made by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.



## Reeves Midget No. 0000 Variable-Speed Transmission

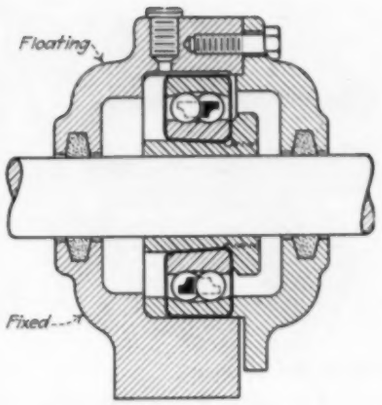
The Reeves Pulley Co., Columbus, Ind., has developed a very small size variable-speed transmission in the vertical type. This No. 0000 unit, illus-



trated, is extremely small and compact, as may be judged by comparison with the 15-in. ruler alongside. Limited space requirements allow this unit to be incorporated in a machine in the upright position. It may be equipped with motor base and individual driving motor, with auxiliary countershaft for greater speed reduction, and with the extended lever type mechanical automatic control. It is also available in a completely inclosed design. Speed range is from 2:1 to 6:1 inclusive. Capacities are from ⅛ to ¾ hp.

## Norma-Hoffmann Ball Bearing Pedestal

A line of unit pedestals for pillow blocks has been announced by the Norma-Hoffmann Bearings Corporation, Stamford, Conn. This line is designated



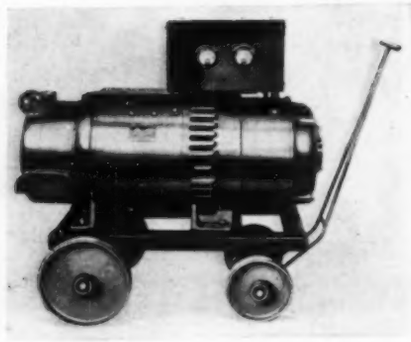

as the "L U P" Series and is adapted to average industrial requirements. It is in sizes to fit standard shafting in nominal inch as well as sixteenth diameters, from $\frac{15}{16}$ to 3½ in.

## Acme Variable-Speed Transmission

A compact "Acme" variable-speed transmission unit has been placed on the market by N. J. Oak, 22 Hawthorne St., Lynn, Mass. This variable-speed unit consists of two cone-faced, intermeshing flanged disks mounted on a sleeve, each disk having a series of steps and three slides. The steps support the chain at different diameters according to the size of sprocket unit for which it is adjusted. The three slides on each intermeshing disk support three sprocket teeth which can be adjusted in or out radially to form either a 15, 18, 21, 24, 27, 30, 33 or 36 tooth sprocket. By releasing a spring catch and turning the adjustment rod, the two cone-faced intermeshing flanged disks are moved inward or outward equally when stepping the variable-speed unit up or down. The variable-speed unit is made in nine sizes, transmitting from ½ to 12 hp.

## Improved Hansen Arc Welders

Increased welding efficiency and speed at reduced cost are claimed for the improved Hansen arc welders developed by the Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis. A new magnetic bridge and a short-circuit winding have extended the welding range, and improved the arc recovery and arc stability. The dead-front control cabinet adds to the appearance and simplifies the design. Single-operator, electric motor-driven types are produced in 100, 200, 300, 400, 600 and 800-amp. sizes. Stationary and portable types are designed to operate on either a.c. or



**Hansen Arc Welder**

d.c. For units up to 300 amp., the motor and generator are mounted as a single unit. Larger sizes are four-bearing units, the generator and motor being direct-coupled and mounted on a welded steel base. The arc welders are dust- and moisture-proof.

## • PATENTS •

NOVEMBER 15, 1932

**Tools and Attachments**

Self-Opening Die-Head. Albert F. Breitenstein, New Haven, Conn., assigned to The Geometric Tool Company. Patent 1,888,067.

NOVEMBER 22, 1932

**Metal-Working Machinery**

Universal Drive for Grinding Machines and the Like. Adolph Storm and Thor Thorsen, Minneapolis, Minn., assigned to Storm Manufacturing Co., Inc. Patent 1,888,480.

Grinding Machine. William Arter, Worcester, and Warren F. Fraser, Westboro, Mass., assigned to Arter Grinding Machine Co. Patent 1,888,710.

Lathe. Calvert B. Cottrell, 3d, Westerly, R. I., assigned to C. B. Cottrell & Sons Co. Patent 1,888,792.

Machine for Shaping Metal Tubes. Elmer James Rivers, Farmingdale, N. Y., assigned to The Aviation Patent & Research Corp. Patent 1,888,807.

**Tools and Attachments**

Cutting Tool. Joseph B. Galbraith, Kaysville, Utah. Patent 1,888,381.

Safety Device for Cutting Machines. Walter Knapp, Lancaster, Pa., assigned to De Walt Products Corp. Patent 1,888,679.

Movable-Chaser Tap. Albert F. Breitenstein, New Haven, Conn., assigned to The Geometric Tool Co. Patent 1,888,816.

Die Mechanism for Forming Tubular Bodies. Duny A. Schutt, New Kensington, Pa. Patent 1,888,837.

**Processes**

Worm Making Process. William F. Zimmermann, Maplewood, N. J., assigned to Gould & Eberhardt. Patent 1,888,782.

Method of Making Tool Handles. Ben Pepperdine, Chicago, Ill. Patent 1,888,885.

NOVEMBER 29, 1932

**Metal-Working Machinery**

Metal Heading Machine. John E. Pracny, Waterbury, Conn., assigned to The E. J. Manville Machine Co. Patent 1,889,004.

Punch Press. Ernest Sass, Aurora, Ill. Patent 1,889,382.

Electric Welding Machine. George A. Lutz, Cranford, N. J. Assigned to American Circular Loom Co. Patent 1,889,413.

Welding Apparatus. George A. Lutz, Cranford, N. J., assigned to American Circular Loom Co., Inc. Patent 1,889,414.

Welding Means. Earl W. Little, Indianapolis, Ind. Patent 1,889,677.

**Tools and Attachments**

Mill Chuck. Joseph M. Redinger, Johnston, R. I. Patent 1,889,571.

Cutter Head Assembly for Routing and Other Machine Tools. George Gorton, Racine, Wis. Patent 1,889,653.

Grinding Mechanism. Frank J. Jeschke, Detroit, Mich., assigned to Micromatic Hone Corp. Patent 1,889,664

## • TRADE PUBLICATIONS •

BORING MACHINES. Catalog No. 3132 covers both models of the precision boring machine built by the Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich. The bulletin illustrates typical set-ups of various types of work that can be done and gives general information on the two machines.

BELTING. The B. F. Goodrich Rubber Co., Akron, Ohio, now has available a 4-page booklet entitled "Lubricated with Rubber," giving the features of its "Highflex" belting.

CRANES. Loadmaster cranes, Models CT, CS and MD, being portable cranes mounted on wheels or caterpillars, are described in a booklet available from the Bucyrus-Erie Co., Department LB-12, South Milwaukee, Wis. Fifty applications of the crane are illustrated.

DILECTO. The Continental-Diamond Fibre Co., Newark, Del., has published a very comprehensive catalog on laminated synthetic products made of Dilecto. Bulletin gives information on standard grades and prices, properties and uses, tubing, rods, sheets, and compares Dilecto with other products made by the company.

ENGINEERING EDUCATION. The Engineering Foundation, 29 W. 39th St., New York, N. Y., has published a pamphlet "Engineering: A Career—A Culture." The professional functions of the engineer are treated with precision, and the major divisions of engineering are dealt with. The pamphlet carries the discussion of engineering as a profession to higher levels than have as yet been attained by works of this character.

GEARS. Silent steel gears manufactured by the John Waldron Corp., New Brunswick, N. J., and for which Smith & Serrell, 20 Washington Place, Newark, N. J., are general sales agents, are discussed in Bulletin No. 71 from the standpoint of construction, advantages and cost. Tables included cover standard blanks, ratings for motor pinions. Information is given on selecting sizes. Machining directions are also included.

PACKINGS. Felt Products Mfg. Co., 1508 Carroll Ave., Chicago, Ill., has issued "A Practical Handbook of Mechanical Packing for Industrial Uses." The unusual feature of this handbook is that 36 different samples of packing materials, including felt, cork, leather, rubber, asbestos, paper and various compositions are stapled to an inside folder. In addition to various types of packings, their uses and information on sizes and cutting thereof are included.

SHEARS. Bulletin No. 70-B, covering the subject of power rotary shears, has been issued by the Niagara Machine & Tool Works, Buffalo, N. Y.

STANDARDS REPORT. The U. S. Department of Commerce, Bureau of Standards, has issued Miscellaneous Publication No. 138, entitled "Annual Report of the Director of the Bureau of Standards," for the fiscal year ended June 30, 1932. Copies are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., for 10 cents.

WELDING. Arc welding data book No. 16 is available from district offices of the Westinghouse Electric & Mfg. Co., or direct from the advertising department, East Pittsburgh, Pa. This 20-page illustrated bulletin describes the features, characteristics and applications of "FlexArc" welders.